JUNE 10, 1957

electronics

business edition

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More Store Automation

Big retailers test sales recorders p13

Countermeasures: Silent War

Spotting hostile radar, missiles is serious business... p15

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NEWS AT A GLANCE

More Store Automation. Right now many large retailers are trying out electronic point-of-sale recorders. Automation won't replace sales clerks, will speed inventory and billing cycles.....p 13

Countermeasures: Silent War. Sniffing potentially hostile radar and missile guidance systems is silent, deadly business. But it may be key to survival in any future global war.....p 15

Cost Controls Tighten. Business keeps booming but sometimes profits dwindle. Businessmen are going all out for economy but with a scalpel, not a meat ax.....p 17

Tubes Keep Auto Lines Moving. How to make sure the right body goes on the intended frame. That's what electronic controls do in one of the country's largest automobile assembly plants.....p 19

Prospectors Buy $15 Million. Electronic instruments help out as man continues to sift earth's crust for oil and minerals.....p 20

Computer Rations Nile. Data processing machines may help nations resolve differences without war. Here a computer weighs conflicting aims and claims of seven countries.....p 22

Radio Sextant Foils Fog. Accurate all-weather navigation for ships and planes, that's what this new navigation instrument offers.....p 24

Air Freight Lowers Costs. Here's a timely tip for businessmen: speed up shipping, cut minimum and maximum inventories at regional warehouses..p 27

New Ceramic Emerges. Harder than steel, lighter than aluminum, that's the new glass nose-cone material for missiles. It has many other electronic uses, too.....p 39

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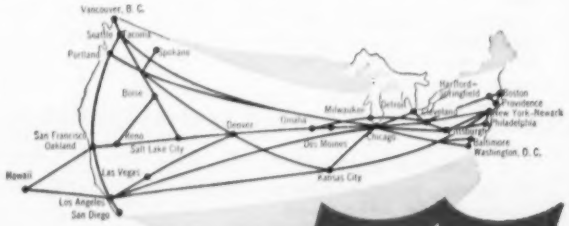

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Dynasert individually operated machines mechanize insertion of resistors at Harman-Kardon, Incorporated, Westbury, Long Island, New York. Costs were reduced, quality increased and inserting time cut by two-thirds over hand methods.

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With printed circuit boards ranging from 2″ square to 6″ x 14″ with comparatively short runs, easy changeover is essential. Also, errors resulting from inserting wrong component or wrong location are practically eliminated. They use these machines to feed a variety of components with axial leads. Machines cut, form, insert and clinch leads. Each operator now turns out three times her former output. In addition fewer components are wasted.

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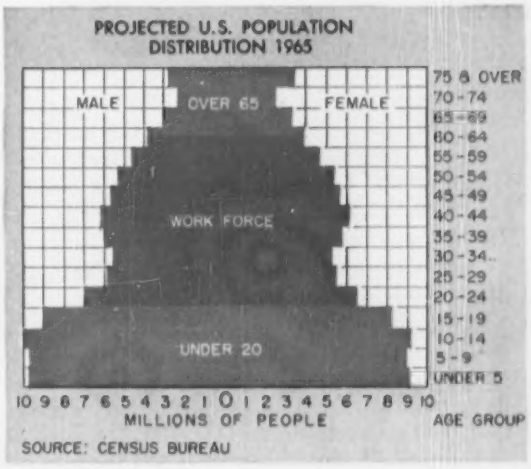
Growth Favors Automation

- **Population is growing unevenly**
- **Work-force is shrinking**
- **Investors favor automation stocks**



RIGHT now American industry is looking to electronics for a way out of the population bottleneck. Because of few births in the '30's, the work force proportion is declining. Oldsters and youngsters who must be supported are rapidly increasing.

Greatly increased use of automated equipment in the next 10 years is inevitable, says Herbert R. Anderson, president of Group Securities. Anderson feels manufacturers of electronic products for automation have excellent prospects for profits in the future.

By 1956 U.S. population will climb from present 168 million to about 190 million. But growth will be uneven. Nonworkers, under 20 and over 65, will increase 15 million, or 20 percent. In-between age groups will increase only 7 million or 8 percent.

Productive age group will account for 52 percent of total population in 1965, compared with 55 percent in 1955. In 1940 this group represented 59 percent of country's population.

Population age-group charts show growing pinch on nation's work-force. Normally such a chart resembles a Christmas tree, gradually tapering from a broad base to a narrow peak. Projected chart of population in 1965 is squeezed in the middle.

SHARES and PRICES

CONGLOMERATE companies, manufacturing widely diversified products, are perhaps the ultimate in industry's trend to diversification. These firms have found the electronics business particularly attractive.

Each of the companies listed below has at least one electronics subsidiary or division.

The idea behind diversification naturally leads to an interest in electronics. The long-run instability of demand for many manufactured products has led to diversification for safety through number of widely different products. An electronics division gives a diversified company product protection by helping it to get in on new products in the development stage. Multiplicity of new products is an outstanding feature of electronics.

This pattern of thinking has led to many mergers of diversified manufacturers with electronic companies. The quickest way to get into the electronics business is to buy in, one diversified company's president recently observed.

Typical Conglomerate Companies	Percent Price	1956 Dividends	Percent Yield	Earned per Share 1956	Earned per Share 1955	Traded	1957 Price Range
ACF Industries	61½	4.00	6.5	4.22 (9 mo)	3.14[4]	NYSE	58⅛–64
American Machine & F'dry.	37½	1.05[2]	2.8	3.03 (yr)	1.66	NYSE	31⅝–38
Avco	6⅝	....	....	d-1.84 (yr)[5]	0.05	NYSE	5⅞–7
Daystrom	35¾	1.20	3.4	2.07 (9 mo)	2.01[4]	NYSE	29⅝–37½
Elgin National Watch	11½	0.90	7.8	0.57 (40 wk)	1.01[6]	NYSE	11⅛–14⅛
General Dynamics	67⅛	2.00[3]	—[4]	4.14 (yr)	4.23	NYSE	54⅜–68⅝
Penn-Texas	11⅜	0.35[3]	3.0	1.57 (yr)	0.32	NYSE	10 –13⅞
H. K. Porter, (Pa.)	58[1]	2.00	3.4	7.07 (yr)	6.15	OTC	.....
Siegler Corporation	15½[1]	0.80	5.2	1.50 (yr)[6]	2.76	OTC	.....
Textron	14⅛	1.60	11.3	1.58 (yr)	2.87	NYSE	13¾–21½
U. S. Industries	16	1.00	6.3	1.88 (yr)	1.93	NYSE	14½–17⅛

[1] bid [2] plus stock [3] annual rate [4] stock splitin '56 [5] fiscal [6] fiscal ending early '56

'Educated' Computers

Automatic coding may ease critical shortage of programmers

NAVY Bureau of Ships buys the second of Remington Rand Univac's $3.5-million LARC computers to work at David Taylor Model Basin, Carderock, Md.

LARC was originally commissioned by University of California's Livermore atomic research facility, is one of the ultrahigh speed class of giant machines—100,000 multiplications a second. Navy will use it for shipboard reactor design, sonar and radar propagation, hydrodynamics and logistics.

Like many modern computers, LARC is almost too fast to operate. It chews its way through man-years of programming in seconds. Consequently it is being built to use automatic coding, refocuses attention on the whole field of computer "education."

Automatic coding adds a stage between programmer and machine. Ideally, an autocode master program accepts a language (called pseudocode) close to the language of the user—scientific symbology, business English, mathematical terms. Computer is "educated" by a stored library of standard routines. Generators, which tailor routines to fit different requirements, are also included in some libraries. Machine interprets pseudocode in its library, generates running program in machine code.

In a recent symposium at Philadelphia's Franklin Institute, some 300 computer users and manufacturers got together to talk about autocoding techniques. When the dust settled this much was clear:

Most users of data-processing gear look to automatic coding to ease shortage of programmers, get more problems into the computer, make more efficient use of machine time.

More machines are being built to make use of the technique. National Cash Register's now-gestating 304, for instance, will automatically do some of the "housekeeping" that goes with an instruction.

Autocoding systems for business problems are now ready and working, with more sophisticated ones coming. Several recognize common commercial English, translate pseudocode commands like READ ITEM B: IF INVALID JUMP TO OP-50 into the right program of instructions to do the job.

MERGERS, ACQUISITIONS and FINANCE

• **Radiation,** Inc., Melbourne, Fla., sells 226,032 shares of Class A common stock. Common and Class A stockholders receive rights to subscribe to 186,032 shares at $12 a share at rate of one new for each three shares held. 40,000 shares of outstanding stock and 129,733 shares of new stock are offered to public at $14 a share. Investment bankers, headed by Kuhn, Loeb and Johnson, Lane, Space, acquired outstanding stock and new stock rights from chief stockholders in advance. New money received, over $2 million, is being used to retire $1.1 million of bank loans and for working capital.

• **Daystrom** plans purchase of **Transicoil,** Worcester, Pa. Purchase is subject to final agreement on contract details. Transicoil manufactures control instrumentation equipment for aircraft, guided missiles and machine tools. Its operations will continue at Worcester plant. Daystrom owns nine subsidiaries in electronics, avionics, automation and nuclear energy.

• **Impact Extrusion Products,** Roslyn Heights, N. Y. acquires **Zinc Extrusion** division of Sun Tube, Hillside, N. J. Acquisition gives Impact a more complete extrusion operation.

• **U. S. Industries** acquires stock of **Kett Corp.,** Cincinnati. Kett, a research and development firm, is active in electronics, aircraft, missiles and atomic energy. Kett stockholders are being paid in USI common stock. Karl Schakel will continue as Kett president.

• **Consolidated Electrodynamics** common stock listing moves from American Stock Exchange to New York Stock Exchange. Its Pacific Coast Exchange listing continues.

• **American Photo Copy Equipment,** Chicago, joins stocks listed on American Stock Exchange.

• **International Business Machines** offers stockholders $200 million of additional common through subscription warrants. Offering ratio is about one share for each ten held. Two for one split for stockholders of record May 7, 1957 was approved. Issue is first sale of new IBM stock since 1925.

• **Magnetic Amplifiers,** New York City, is issuing 90,000 shares of 50-cent par common stock at about $3.25 per share. D. A. Lomasney of New York is underwriter.

• **Erie Resistor** stockholders approve major capitalization changes to provide funds for growth. Presently outstanding $5-par common stock is to be split two for one. Authorization of 1,500,000 shares of $2.50 common replaces presently authorized 500,000 shares of $5 common. New issue of 200,000 shares of $12.50 preferred is also authorized. Outstanding 62,475 shares of $20-par preferred, convertible in 2.2 shares of new common, is being called.

• **Aeronca Manufacturing,** Middletown, Ohio increases number of authorized common shares from 600,000 to 1 million. Company has no present plans for issuance.

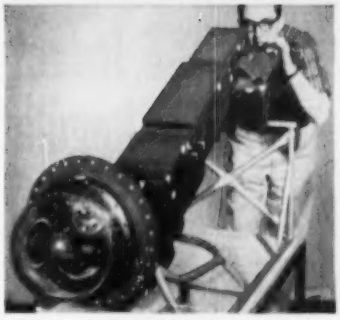
PIONEERING SCIENTIFIC FRONTIERS AT GENERAL MILLS

He's getting new basic knowledge on properties of semi-conductors

Here Dr. Rolf K. Mueller determines electrical properties of a semi-conductor specimen having a low angle grain boundary. He and his colleagues in the Electron Physics Laboratory of the Mechanical Division of General Mills grow their own pure specimens with carefully oriented crystal structures (germanium in this case). They then mount specimens very precisely for basic research involving the effect on physical properties of varying angles of junction. Variation of the angle of crystal orientation at the junction (the "grain boundary") has a predictable effect on the electrical reactions of the semi-conductor.

Semi-conductor work is but one facet of an integrated program in solid state physics. Studies of chemical, mechanical and surface properties of solid crystals and "sputtering" of metals under ion bombardment are among several other areas presently being researched in the Electron Physics Laboratory.

Some of this research is still basic, but it typifies the advanced and creative work we do. In many fields, this "research for tomorrow" is translated regularly into practical applications for industrial and military use today. If you have product or production problems, possibly you can profit from these applications and from our precision production facilities.



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WASHINGTON report

CONGRESSMEN pushing economy have bitten into funds for electronics procurement in the Defense Department budget. The House Appropriations Committee whacked funds for SAGE and had critical things to say about guided-missile programs.

The Pentagon is fighting hard before the Senate for restoration of the $2.5-billion appropriation slash by the House committee from the fiscal year 1958 budget. Actually, this cutback—if carried through in the final House-Senate bill—would mean an overall cutback in spending of only about $200-million next year.

For the most part, the appropriation cuts are aimed to force the Pentagon to draw on the heavy carryover funds appropriated in prior years but still not obligated—totaling about $10-billion.

In electronics, the House committee cut the Air Force's $486.5-million appropriation request for ground communications and related gear by 6.3 percent. Included in this program are SAGE, radar gap-fillers, early warning systems, air control and navigational aids, ground radio, countermeasures, and cryptographic equipment.

The cutback, says the committee, will mean a stretchout in SAGE and general early-warning radar plans. But, the committee points out, "the SAGE program has not been reassessed as a result of the recent reevaluation of the immediacy of the Russian jet bomber threat. Some minor stretchout in this program should, in the long run, result in a much more effective system."

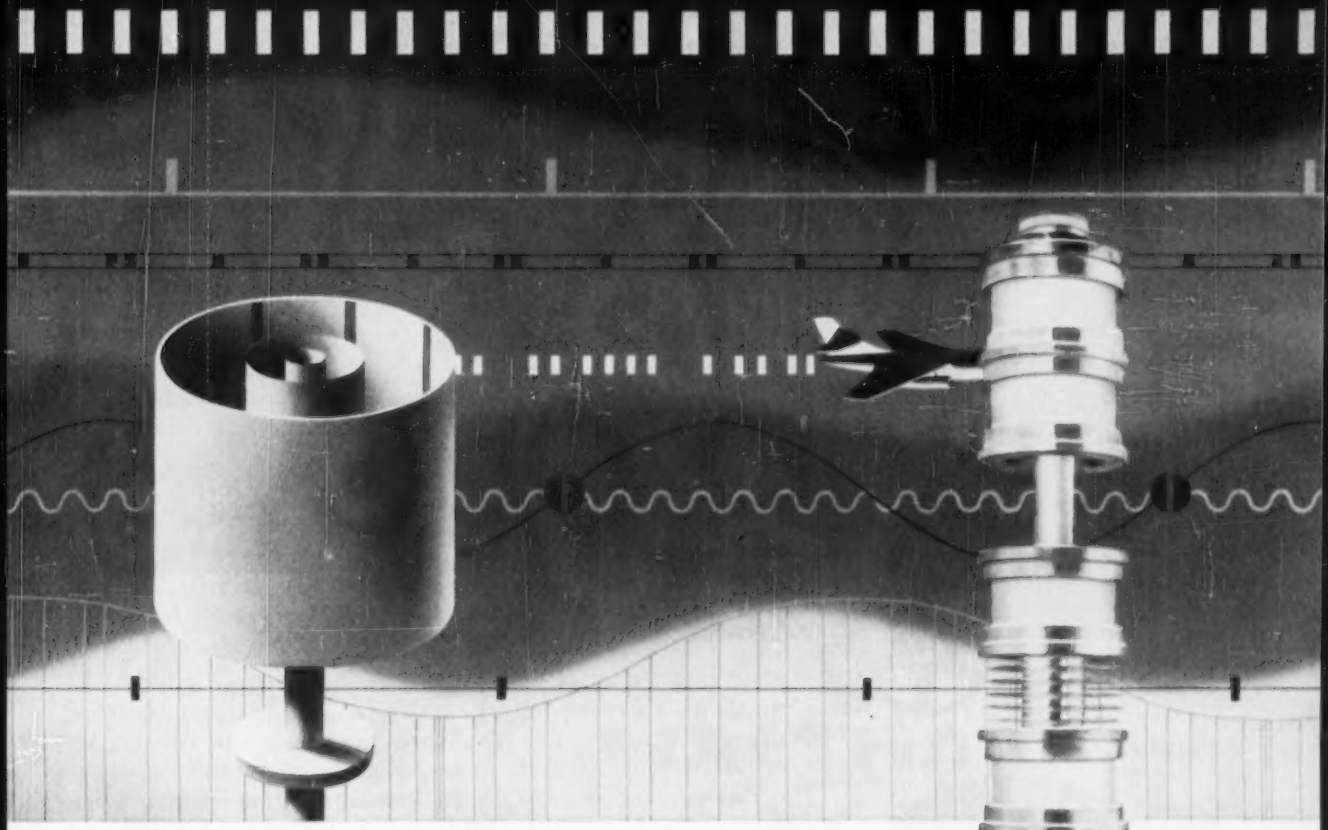
Backing up the cutbacks, the committee criticizes the Pentagon for failure to (1) set up basic and uniform cost principles in procurement; (2) "improve procurement-audit relationships"; and (3) take "decisive action" in coordinating missiles: "there is evidence that programs have been continued even after advances in the art have made them obsolete."

• **Twelve-man** electronics division and eight-man communications division in the Commerce Department's Business and Defense Services Administration will be scaled down or merged as a result of the sharp reduction in the agency's fiscal 1958 budget. But both divisions rate high in importance among the 25 BDSA industry divisions because of their direct defense activities—aiding military contractors in procurement of scarce components and materials, compiling industrial readiness data for use in all-out mobilization. This means the two divisions will be hurt the least by the budget cutback.

• **Outlook** for FCC's eventual approval of a test for pay television systems has been swinging up and down for months. Now it's up again with a decision by the seven-man commission that its legislative charter gives it authority to license such a test if it finds the test in the public interest. The commission itself, and congressional experts, have had doubts about this.

• **Radio** and tv industry representatives are seeking assurances from the FCC and the antitrust division of the Department of Justice that their participation in a joint engineering research project will not involve them in antitrust charges.

Justice Department has ruled that all meetings must have a government official on hand; with FCC officials already attending meetings, no change in TASO membership is felt to be necessary.



Eimac X676 Modulating Anode Klystron

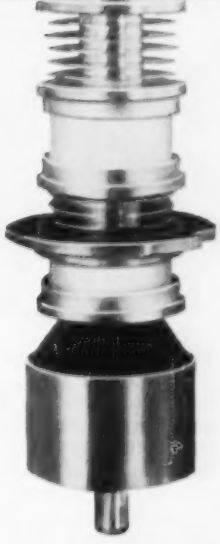
Shaped RF Pulse, 30 KW Peak Power Output for 955-1220 mc Air Navigation Systems

Designed for air navigation systems, the Eimac X676 three cavity, air cooled klystron will deliver 30 KW peak power output in the 955 to 1220 mc range. With a power gain of 35 db, this tube has an efficiency of 40 per cent.

A typical air navigation systems requirement is a shaped RF pulse output to eliminate spectrum interference in adjacent channels. The Eimac X676 conservatively meets the 60db requirement of the CAA's air navigational system without using critically tuned, expensive filters in the RF output transmission line. The modulating anode permits pulsing the beam current while keeping the accelerating voltage constant. Also, the modulator circuit for this application is quite simple.

The RF cavities are external to the vacuum system and detachable from the klystron. The user may purchase spare tubes without buying additional tuning and focusing assemblies.

For the design engineer, the features of the X676 simplify circuitry – for the equipment operators the X676 provides reliable, long-lived performance at moderate cost.



For further information about the Eimac X676 Modulating Anode Klystron, consult our Application Engineering Department. Also available are two highly informative booklets; "The Care and Feeding of Klystrons" and "Klystron Facts . . . Case Four".

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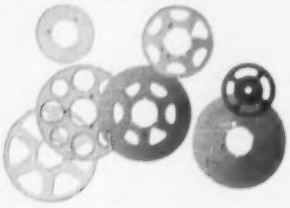

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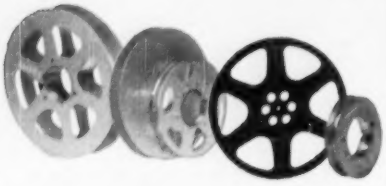

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EXECS in the news

Lawyer Pace: for GD, 50-50 split

NEW HEAD of billion-dollar General Dynamics Corp. is 44-year-old former Army secretary Frank Pace. The lean lawyer from Little Rock, a broad-brush, big-picture type, is seen above with new executive v-p Earl D. Johnson (left in the picture), long his right-hand man.

Pace was handpicked by the late John Jay Hopkins, the man who in ten years parlayed Electric Boat Co. (1946 sales: $14 million) into the nation's 34th largest industrial firm. Hopkins called him in the spring of 1953 to discuss "various matters." ("I'd met him once, casually, before that," Pace relates.) One matter was Pace's becoming GD's executive vice president.

At Princeton and Harvard Pace acquired his legal training—and his wife, Philadelphian Margaret Janney, whose brother was a Princeton classmate. Before the war he worked for his home state of Arkansas and his father's law firm. War put him in the Army Air Corps (he holds a lieutenant colonel's commission in USAF Reserve).

In 1945 he went to Washington, worked for Attorney and Postmaster Generals. Truman noticed the bright young administrator, put him in the Budget Bureau in 1948, made him director in '49. His first budget coughed up a $3.5-billion surplus. He became Army secretary just in time for the Korean action to land in his lap.

Pace is indefatigable; 12-to-18 hour days were routine during the Washington years. He plays tennis and golf with almost professional precision, is a member of President Eisenhower's Burning Tree club.

Legal training has made him a lucid talker, genial and unfailingly gracious. And he has a mind like a steel trap.

Under Pace's presidency, GD plans to continue its expansion program. Guns-and-butter split of its products is now 85 percent guns. Ultimately, Pace wants a 50-50 split.

Strictly PERSONAL

Snowshoes, Anyone?

The United States program for the International Geophysical Year has already been launched in the Antarctic, and the first phase of this program is fully underway. Due to the stringent time schedule connected with operations in this region, recruitment of scientific

personnel for the second phase of Antarctic operations of the IGY, 1958-59, is already in progress.

The program of observations (of the group now on-station) will continue until April, 1959. A second group will leave the United States about November 1, 1957. Prior to departure, approximately two months of advanced training will be provided.

Most of the current openings are in fields of meteorology and glaciology, although other fields still require a limited number of specialists.

HUGH ODISHAW
U. S. NATIONAL COMMITTEE, IGY
2101 CONSTITUTION AVE.,
WASHINGTON

A Whiff of Sulphur

I call to your attention a grievous error in "Business Meetings" (Apr. 20, p 46). You list a meeting of the Scientific Apparatus Makers Association on April 27-May 2 at the Greenbrier, White Sulphur Springs, Va.

White Sulphur Springs, home of the fabulous Greenbrier Hotel and Cottages, is in WEST Virginia. WEST Virginia is a sovereign state, having been admitted to the union on June 20, 1863. . .

Come to see us sometime.

ANDREW V. RUCKMAN
WEST VIRGINIA INDUSTRIAL AND PUBLICITY COMMISSION
CHARLESTON, WEST VA.

We suspected our 1861 Atlas was a little outdated.

Ultrasonics

In "Reps to Get Ultrasonics" (Apr. 20, p 48), Mr. Gulton of Gulton Industries comments that ultrasonic equipment is about to be distributed by reps.

As you perhaps know, our division of Bendix Aviation Corp. has pioneered the field of ultrasonic cleaning for industrial uses. Our marketing setup has included sectional distributors (reps) from its inception.

J. B. WELLS
PIONEER-CENTRAL
DAVENPORT, IOWA

need precision production help?

WALTHAM

can develop and make your miniature assemblies

When your designs require miniature or sub-miniature assemblies in volume, Waltham facilities are the answer to your problems. At Waltham you'll find the specialized tools—many made in our own shops to meet specific needs—and the highly skilled people with long experience in operating them.

Waltham competence in precision instrumentation, as evidenced by our performance record on contracts for major producers, can be applied to your requirements ...efficiently and economically.

The same ingenuity that gave the new Waltham Vertical Gyro its superior performance characteristics can be applied to resolving the production problems facing you.

A Waltham engineer is well qualified to talk to you about mechanical or electromechanical assemblies. Ask him to call on you—or send us your drawings and specifications.

INSTRUMENT AND INDUSTRIAL PRODUCTS DIVISION
WALTHAM WATCH COMPANY
WALTHAM 54, MASS.

Precision has been our business since 1850

Case History from the files of the Wincharger Corporation

problem: PREVENT CORONA FLASH-OVER IN DYNAMOTORS AT INFINITE ALTITUDES

At the end of World War II, Wincharger was providing aircraft manufacturers with dynamotors designed to operate at 30,000 feet. But as higher altitude jet aircraft were developed, this same dynamotor was facing altitudes up to 80,000 feet.

These infinite altitudes presented complex electronic problems. One of the more serious was Corona flash-over.

Wincharger's Research and Development Group tackled the problem. They found the solution in the Dynamotor's insulation. New methods and materials were used against Corona flash-over action. And the newly insulated Wincharger Dynamotor operated with dependable efficiency at stratosphere heights.

If special purpose Dynamotors and power supplies solve your problem, contact Wincharger. Their extensive experience in solving problems in all phases of these fields is your best assurance of a workable solution. **DEPT. E67**

WINCO®

Specifications

Input	**Normal 27.5 Volts D.C.**
Output No. 1	**600 Volts D.C. at 550 Mils.**
Output No. 2	**250 Volts D.C. at 150 Mils.**
Unfiltered Ripple Maximum	**1%**
Duty Cycle	**5 minutes on, 5 minutes off, and repeat.**
Ambient Temperature	**Minus 55° C to plus 85° C.**
R.P.M.	**8,500**
Altitude	**80,000 feet.**

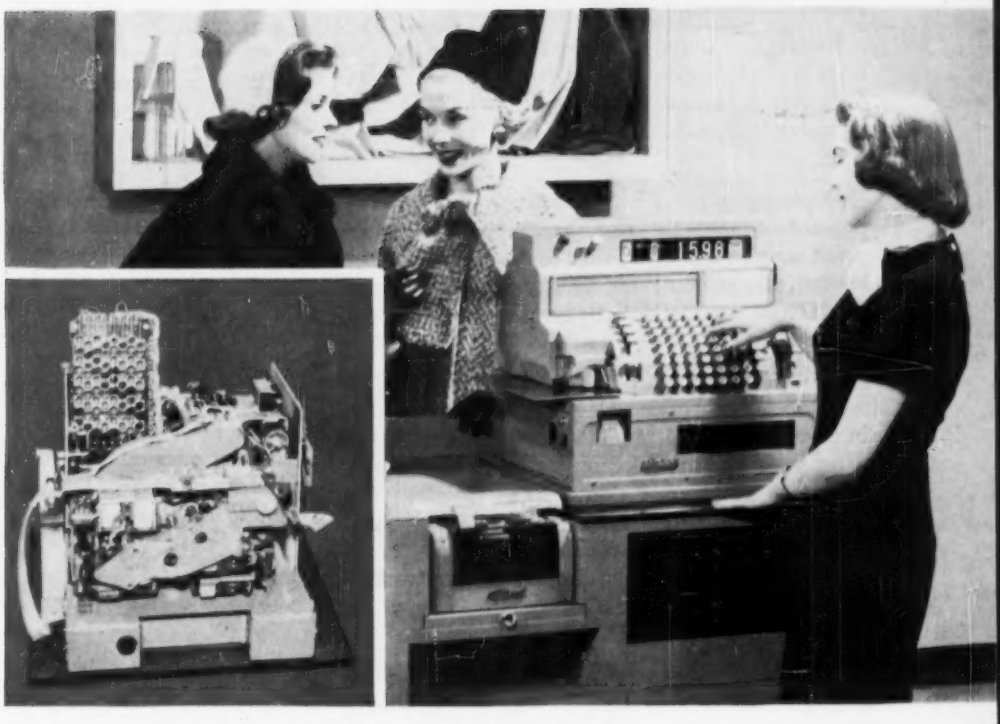
WINCHARGER CORPORATION

SIOUX CITY, IOWA

Subsidiary of the Zenith Radio Corporation

electronics
business edition

JUNE 10, 1957



Point-of-sale recorders point to . . .

More Store Automation

- **Several electronics manufacturers already in field**
- **Department store interest strong, many tests underway**
- **Big future market predicted, chain-store interest grows**

RETAILING, one of the last frontiers of automation, is yielding to electronics. Point-of-sale recorders are providing the key to unlock this big market.

Benefits recorders can soon provide retailers are:

- Automatic charge account billing
- Inventory control
- Accurate merchandise accounting
- Salesclerk and branch-store identification

Point-of-sale recorders may be a major equipment item in the next few years. They are now emerging from developing and testing stage.

Recorders pictured have three units: cash register or adding machine keyboard, tag reader for print-punch tags, punched paper tape recorder.

Sales information is transferred from keyboard or tag reader to perforated tape. Taped information is run through interpreting machines, gives store executives billing, merchandise and inventory control information.

Some models omit tag reader, take data directly from register. Tag readers are designed to speed up

recording by picking up sales data from holes in prepunched Dennison or Kimball price tags.

At least six companies are manufacturing or developing recorders: Telecomputing (marketed by Remington Rand), National Cash Register, Clary, Friden, Sweda Cash Register and RCA. Burroughs is reported developing a recorder for store test this Fall.

Remington Rand-Telecomputing recorder has been in regular production for about a year. National Cash Register plans regular production in Fall. Clary is freeing its San Gabriel plant for recorder manufacture.

Department stores are enormously interested in point-of-sale recorders, retail leaders say. Falling net profit margins and rising wage costs are fostering this interest, says Milton Woll, director of National Retail Dry Goods Association's Retail Research Institute. Department store after-tax net declined from 4.55 to 2.85 percent of sales between 1947 and 1955.

Retailers are working closely with manufacturers in developing recorders. One recorder was developed three years ago by Telecomputer with the help of executives of J. W. Robinson, Los Angeles. The NCR machine, currently being tested at Macy's New York, was built to store specifications. The National Association of Shoe Chain Stores has been working closely with equipment manufacturers on machine development for two years.

A list of stores testing or using recorders reads like a who's who of American merchandising: Jordan Marsh, Boston; Strawbridge & Clothier, Philadelphia; Sibley, Lindsay & Curr, Rochester; L. S. Ayres, Indianapolis; F. & R. Lazarus, Columbus; Meier & Frank, Portland, Ore.; John Shillito, Cincinnati; Horne's, Pittsburgh; Bullock's, Los Angeles; and Higbee's, Cleveland. Gimbel Bros. and Alexander's are planning tests in the New York area.

Comments by executives of stores using and testing recorders are enthusiastic.

Macy's assistant comptroller, Roman Weller, says, "In a few years everyone will be using them."

J. W. Robinson's treasurer, Harry N. Krotz, says, "Point-of-sale recorders are the only answer to merchandise control problems. Our buyers are enthusiastic about their help." Robinson's has been using recorders in the LA area for several years.

Sibley, Lindsay & Curr's treasurer, Douglass C. Coupe, is enthusiastic about their ability to control branch-store operations. Siblely's has had 24 recorders in branch-store use for almost a year, is now adding them to its main store.

On the other hand, current costs do not justify recorder installations for all stores, says Milton Woll of National Retail Dry Goods Association. Only the giants like Sears, Macy's and Associated Merchandising Corp. can, he thinks, at this time justify the expense.

Using a store with sales of $20 million as an example, Woll estimates installation costs of 100 recorders at about $5,000 each and a computer at $200,000—a total near $¾ million. The only offset would be savings in accounts-receivable payroll through automatic billing. But this item would total just $140,000 per year.

Woll recommends a system of joint computer use similar to that recommended for banks.

With most activities still in the testing stage it is difficult to estimate the potential market with any degree of precision. It looms large.

Back on the positive side of the question, J. M. McCormick, tabulating sales manager for Remington-Rand, estimates the market is in thousands of units. His company expects to sell a minimum of 250 this year. Paul Cates, research director of Sweda Cash Register, estimates that every store with sales of more than a million dollars is a good prospect.

In 1954 there were 1,673 stores in the plus $1-million sales category with total sales of about $10 billion. About 500 stores in the plus $5-million sales group had total sales of $7.2 billion, average sales per store of $14 million.

Department stores are not the whole big-store recorder market. There is also the chain-store market, and new uses are being constantly found. One manufacturer is negotiating for the sale of 200 recorders to a personal finance company.

New Market Opens

THERE'S A NEW market for economy-size inventory control systems. In it, equipment rental is one-half to two-thirds less than for some systems now in operation.

These views are expressed by S. J. Sindeband, president of Teleregister. His firm has just provided electronic equipment for an automated inventory control system in the B. F. Goodrich-Hood Rubber plant in Watertown, Mass.

Monthly rental for the system is under $10,000, says Sindeband. He won't give exact costs.

Technically, there's nothing revolutionary about Teleregister's installation. But it may help open new markets for the electronics industry: data processing for small and medium sized plants.

The new system does the work of 50 clerks and slashes complete inventory-taking from three weeks to three hours. It memorizes 30,000 styles, sizes and colors of footwear. It has random, high-speed access. The magnetic storage drum is 20 inches in diameter, 30 long, spins at 1,300 rpm. It handles 6,000 entries daily.

Engineers check out strategy of . . .

Countermeasures: Silent War

- **Undoing radar, guidance systems, is booming business**
- **Air Force aim: to get more bombers to more targets**
- **Twt's, computers help find and foil detection systems**

SEVERAL times each week, a modified B-17 flies over New York on its way seaward from the North Jersey countryside. It looks rather like a wounded hedgehog; antennas thrust out all over it, blisters mar its lines, slots and resonant apertures are cut into its sides. It can pick up just about any r-f energy around.

The plane is Federal Telecommunications Labs' countermeasures test and reconnaissance plane. Its job is to listen in on electronic activity, check out IT&T's mushrooming work in equipment designed to undo electronics' best efforts.

Electronics is a major weapon, a kicker card in many hands at the international gaming table. As a result, development of electronic countermeasures is big, important business. A score of companies are already deep in the business, and it's getting bigger every year.

Electronic countermeasures—ECM—divides into two main branches, with reconnaissance as a third major effort.

• Passive countermeasures prevent recognition without sending out signals; camouflage or conceal the target instead. They include reflective materials such as chaff, absorptive paints, special surfaces.

• Active countermeasures radiate deceptive or misleading signals, or throw out electronic smokescreens to prevent identification.

Reconnaissance—sometimes grouped as part of passive measures—is needed to find potentially hostile stations. After reconnoitering, electronic equipment can determine type, location, antenna and beam characteristics, carrier and pulse-repetition frequencies, and probable function.

Air Force is particularly interested in ECM, spends far and away the most money on it. Aim of Air Force is to get more of its bombers through more radar screens to more potential targets. To airmen, ECM replaces defensive brawn with brain.

Half the cost of a modern bomber is electronic equipment, and about 30 percent of this gear is ECM. Tucked away in the defense budget is an estimated half-billion dollars for purchase of countermeasures gear. Another $40 million or so goes for R&D.

It's a secret war, this one. Nobody wants to talk about it. Questions are met with blank looks, apologetic or embarrassed silence, the meshwork of security classification.

This much is plain: countermeasures exploit radar's chief weaknesses:

• Powerful radar transmitters can be "seen" long before they themselves can see.

• Weak radar echoes can be drowned out, mimicked.

• Range discrimination, based on elapsed-time

measurements, can be electronically confounded.

Traveling-wave tubes make big contributions to ECM techniques. Broadband characteristic of twt's make possible efficient reconnaissance receivers, big hurdle of wartime efforts. One source reports annual sales of $700,000, mostly for ECM work.

Even chaff has become sophisticated. These thin metal strips, cut to resonance of scanning antennas, used to be thrown out of planes. Operators learned to zero on leading target, letting the chaff drift downward. Nowadays the stuff is fired up into the air, propelled torpedo-like out the side, otherwise given the appearance of having life of its own.

Repeater systems capable of aping signals at controlled intervals can make a ground radar see six planes where there is actually only one. Other systems can make a little plane look like a big bomber, or make a returned echo so big that a range fix is impossible.

Blanketing material that blots up r-f energy can make a plane nearly invisible to radar. Experiments have been tried using planes with plastic shells and "blotter" insulation. Such planes are necessarily slow but, as one engineer remarks, "the hare, for all his speed, is more vulnerable than the tortoise."

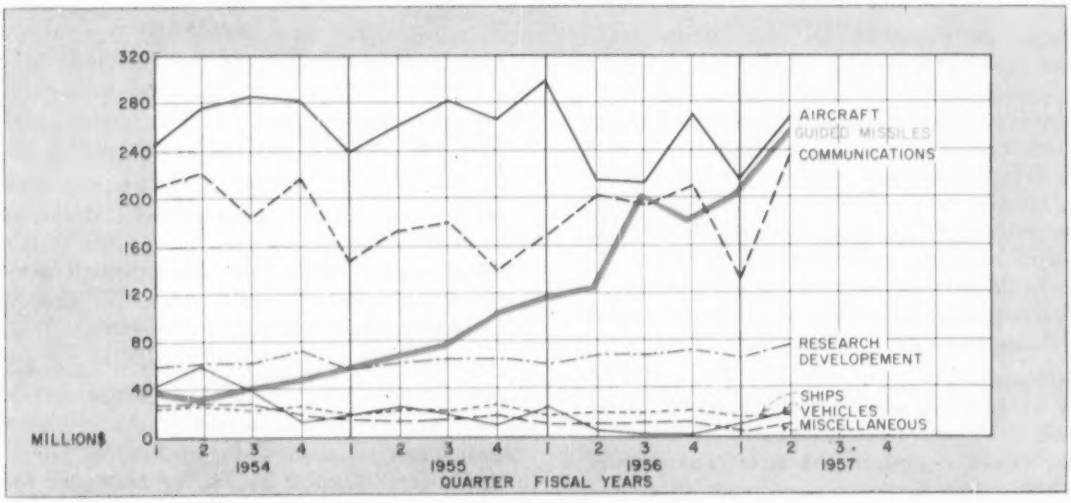
Animal techniques for protection give the clue to much ECM work.

Night-seeing ferret is model for ECM reconnaissance. Ferret planes have been flying since the war, picking up signals, providing ECM intelligence.

Man's invention, the sitting duck, is another ECM model. Noisemaking assemblage of electronic gear can lead hostile forces into crossfire, or decoy them away. This old trick is brought to new perfection with electronic overtones in countermeasures game.

Recording and computing equipment are vital parts of ECM, especially in reconnaissance. Computers are used to analyze radar scans. On the fire now: airborne directors that will reconnoiter, pick up scans, advise flight commander on the spot as to best measure for evading or confusing the scanner.

PRODUCTION and SALES



Missile Electronics Rivals Aircraft

Rapid growth of electronics for guided missiles stands out in estimates of defense electronics spending recently released by RETMA. Using a newly devised formula, association extracts electronics military expenditures from major defense procurement categories.

• In two and a half years electronics for guided missiles jumped from one of the smaller spending categories to the point where it is challenging aircraft electronics. In the first half of fiscal 1957 guided missile electronics expenditures represented 30.1 percent of the $1.5 billion spent on defense electronics. Percentages devoted to other categories of electronics were: aircraft 31.4, ships 2.3, vehicles 2.2, electronics and communications 23.8, research and development 9.1 and miscellaneous 1.1.

• In fiscal 1956 guided missiles accounted for 22.2 percent of $2.8 billion spent for electronics. Breakdown of other groups was: aircraft 35.4, ships 2.8, vehicles 1.2, electronics and communications 27.3, research and development 9.4, miscellaneous 1.7.

Cost Controls Tighten

- **Manufacturers launch new efficiency programs**
- **Selective economizing replaces across-the-board cuts**
- **Research and development methods are streamlined**

ELECTRONICS industry is tightening cost controls as if they were a belt—around its waste.

Manufacturers are meeting head-on the challenge of rising costs and shrinking profits. Planned yearly savings are expected to hit several million dollars. Sprague Electric alone reports "new production steps may save $100,000 a year."

Today's economy drives have a new look. There are fewer across-the-board slashes. "Let's do it better, faster, cheaper." That's the motto.

Barry Controls, Inc., recently started using a five-part monthly report system to improve its engineering work. Report lists: Number of projects started, number of projects completed, number of projects in process, number of new designs completed and new sales based on new designs.

The firm has relieved engineers of administrative work. Its goal: "Engineers do just engineering." How's it going? "We're putting through a bigger workload than six months ago," says an official.

Baldwin-Lima-Hamilton Corp. is also mining the do-it-better vein, remaking its designs. And each design is being checked against present shop tooling and size restrictions.

Research and development programs are not being carved. But they are being checked more closely. Streamlined, too. And projects have to produce sooner, or be dropped—even if dropping means taking a loss.

One manufacturer says it saves in research by better initial planning. Its three-step system: Get top minds in early, come as close to the problem solution as possible, then let less-expensive manpower carry on.

Raytheon reports battling dwindling profits both internally and externally. Internally: find better ways to produce and buy; seek substitutes for critical materials; avoid specialty work where possible; decentralize, thus making it easier to find out where costs are out of line or rising.

And, externally: extend labor agreements; be more selective in accepting business; be more argumentative with the government on profit rates, fees.

Raytheon is also giving more attention to middle-line management. Two new steps this year: policy-making and next-lower-echelon executives meet monthly to review previous month's results; the three levels of top management lunch monthly and are addressed by a company executive.

Some companies are trimming fixed sales costs by giving more bonuses instead of large salaries. Other firms are cutting budgets slightly but being sure not to sacrifice sales programs. One official said: "I'm trying to get salesmen off their seats."

Improving efficiency isn't the whole answer for every company. Cambridge Thermionic increased its minimum billing from $3 to $10. And prices of some of its products when ordered in small quantity were raised 5 percent to 40 percent. Customers complain? "Less than I expected," says an official.

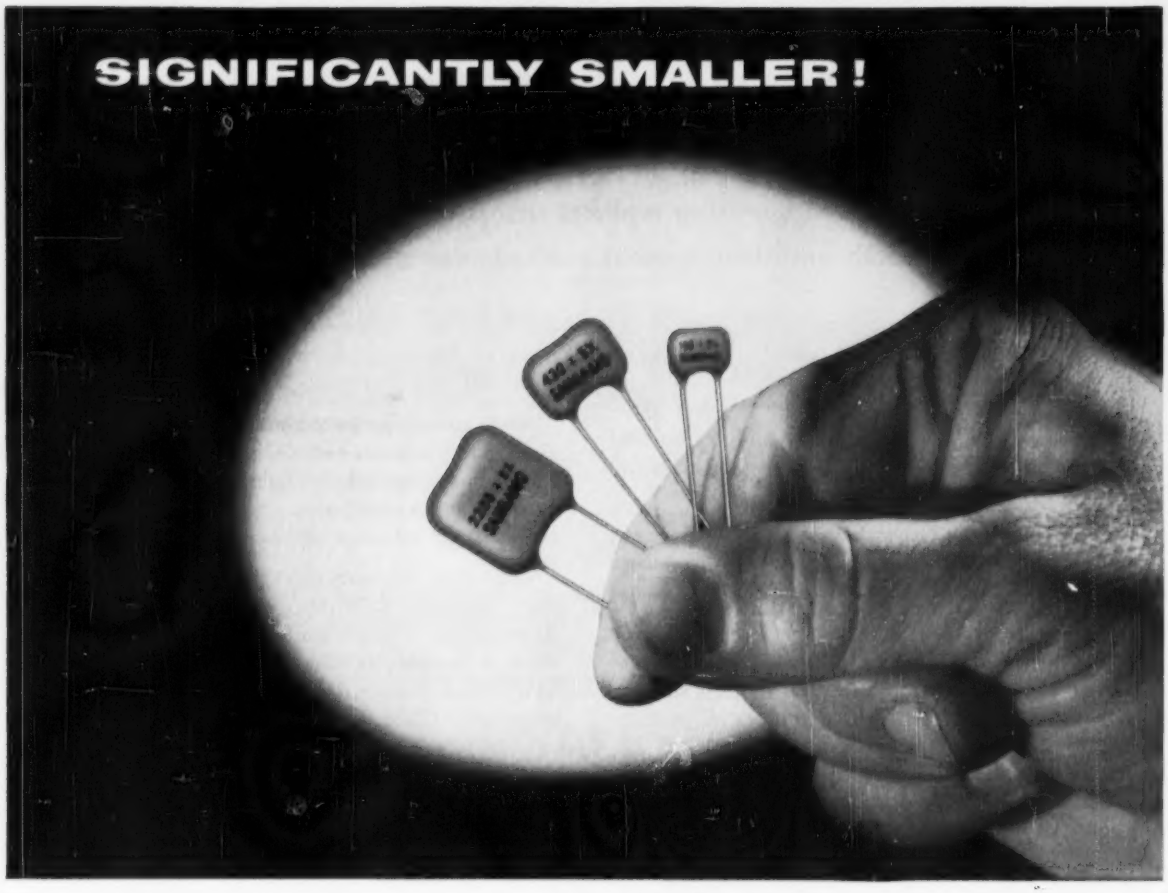
Cost cutters are revamping office procedures, axing unnecessary paperwork, adding automation.

Cost reduction committees function in each major product division at Sprague, a new systems and procedures department has been set up.

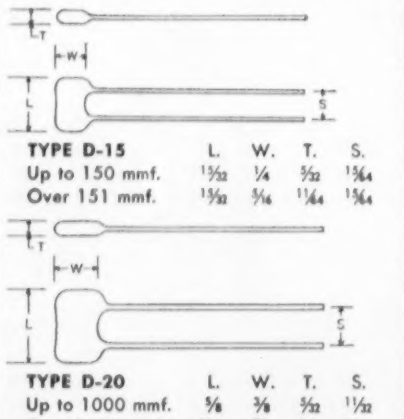
Calling Vanguard's Shots

Floated integrating accelerometer by Reeves will measure speed of Vanguard's launching vehicle during second and third phases for deviations from expected speed. Data, fed into a coasting-time computer, generates signal for jettisoning second stage, firing third. Major parts of accelerometer are gyroscope and pendulum

SIGNIFICANTLY SMALLER!

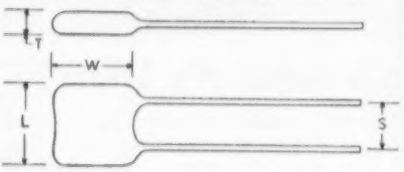


Dimensional Diagrams



TYPE D-15	L.	W.	T.	S.
Up to 150 mmf.	13/32	1/4	5/32	15/64
Over 151 mmf.	13/32	5/16	11/64	15/64

TYPE D-20	L.	W.	T.	S.
Up to 1000 mmf.	5/8	3/8	5/32	11/32
Over 1001 mmf.	11/16	7/16	3/16	11/32



TYPE D-30	L.	W.	T.	S.
Up to 4000 mmf.	11/16	23/32	3/16	7/16
Over 4100 mmf.	3/4	23/32	7/32	7/16

SC57-5

NEW...SANGAMO "RESIN-KOTE" MICA CAPACITORS

- PHYSICALLY SMALLER
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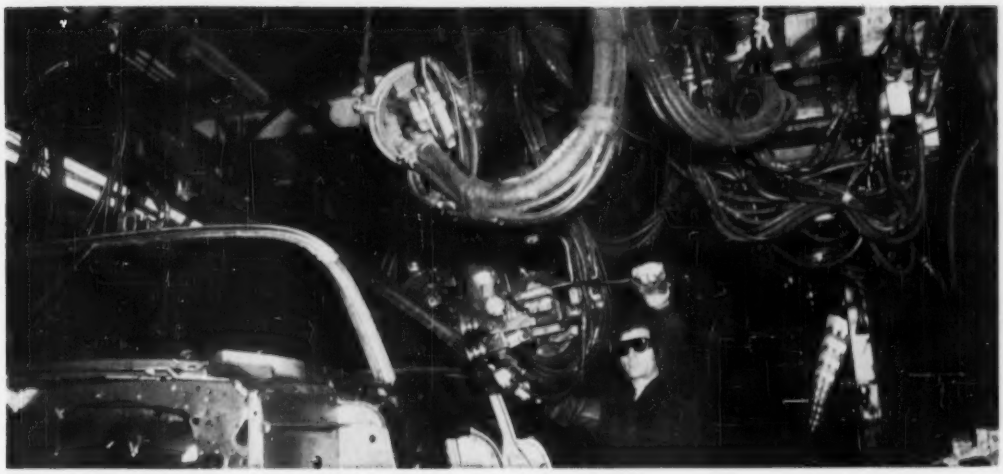
- EXCELLENT ELECTRICAL CHARACTERISTICS
- EXCELLENT FOR AUTOMATIC ASSEMBLY METHODS
- EXCEED APPLICABLE RETMA SPECIFICATION RS-153
- FABRICATED FROM THE FINEST INDIA RUBY MICA

Available In Capacitance Values From 5 to 20,000 MMFD
In Standard ± 10% Tolerance. Closer Tolerances Can be Supplied.

Write For NEW Engineering Bulletin TSC-118.

SANGAMO ELECTRIC COMPANY
Electronic Components Division
SPRINGFIELD, ILLINOIS



Electronic welder runs seam as . . .

Tubes Keep Auto Lines Moving

- **Help simplify tricky business of automobile assembly**
- **GM's 85-acre N.J. plant uses remote control on two main conveyors**
- **400 high-speed welding guns sequence timed by 3,000 tubes**

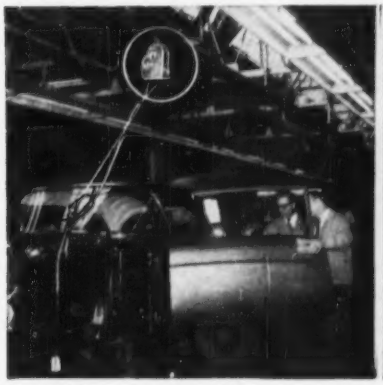
ONCE in a blue moon, a car will follow its identical twin on an auto assembly plant's final production line. More often, the line is a kaleidoscope of models, colors and accessories.

Know-how, helped in recent years by electronics, keeps production moving at GM's Buick-Oldsmobile-Pontiac assembly division's New Jersey plant.

When the plant opened in 1937, gears and a-c motors ran the lines. Slippage and slow-down meant lost time. Now, two electronic control panels and synchronous d-c motors maintain desired speed on two main conveyors.

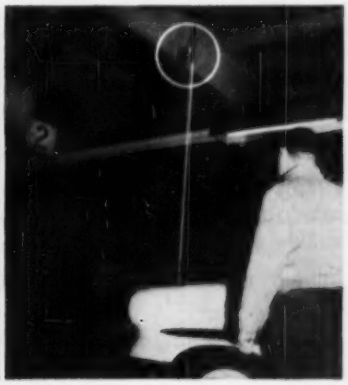
Originally, the plant had 36 welders sequenced partially by electronics. Today, over 3,000 tubes time 400 welding guns.

Six lines use phototubes to detect stalled cars at the output and prevent jams. Electronic controls also prevent explosions in drying sheds, maintain spray booth temperature, inspect wiring and wheel alignment.



POWER pack tests radio

AMPLIFIER meters wheel toe-in



PHOTOTUBE clears factory door

Weird whirlybird stalks oil, minerals as . . .

Prospectors Buy $15 Million

- **Sales of seismograph systems hold at $10 million**
- **Emphasis on airborne surveys means more electronics**
- **Nonprofessional prospectors buck up geiger counter sales**

GEOPHYSICAL exploration for oil and minerals costs about $400 million annually. Electronics gets $15 million-plus by providing instruments.

A survey by the Society of Exploration Geophysicists shows oil firms spent $250 million in the U.S. and another $150 million world-wide in 1955 prospecting. Long-term prospect is for increased hunting.

Most oil work falls to seismograph crews. A record 1,119 crews operated in 1955, 591 in U. S.

Oil men figure field seismograph equipment costs $50,000 to $60,000 a crew. Gear wears out or becomes obsolete in five years. This indicates a $10-million annual market.

Home-base equipment costs have rocketed in the past two years. A major factor is introduction of magnetic recording and data-processing systems. Recorders cost up to $150,000 and 150 were bought in 1955.

Modern seismic equipment must handle 24 to 50 channels of information. Transistors are not yet commonly used. But geophysicists say that size and power considerations—especially for field equipment—virtually assure future use of transistors.

Offshore exploration frequently requires radio-location equipment, radar and sediment-probing types of sonar. Aircraft using magnetometers handle land reconnaissance. Many crews require radio communications.

Supplying equipment to oil men requires oil savvy. Proof is that many useful improvements originate in oil company labs or in instrument firms rooted in the oil fields.

Mining firms in 1956 spent $11 million on professional exploration, according to the society's preliminary survey. That is $4 million over known 1955 expenditures.

Seismography leaped to first place in mining as

well as oil during the year. Expenditures increased from $350,000 in 1955 to an estimated $2.4 million in 1956. Recently developed high-frequency techniques have made seismographs reliable locators for shallow ore bodies.

Next comes airborne magnetic surveys, with $2.2 million. Equipment used indicates lodes by sensing changes in the earth's magnetic field.

Ground and air electromagnetic detection claims $1.6 million. Variations in induced frequencies spot locations of metallic sulfides.

Radioactivity and geochemical surveys employing radiation counters take around $800,000. Research and methods shy on electronics account for the remainder.

Emphasis on mining exploration is going to airborne surveys because they are cheap and fast. The more planes, the more electronic equipment needed.

Hunting Associates estimates that 70 percent of geophysical exploration in Canada is airborne. Aero Service Corp., another international exploration firm, estimates 75 to 100 planes are active in general work. Another 20 planes are equipped with radiolocation gear for specialized surveys.

Equipment costs run up to $10,000 for scintillation counters, $1,500 for radio altimeters and an estimated $15,000 for leased magnetometers. Aero recently invested $60,000 in installing a new kind of electromagnetic detector. Radar altimeters cost up to $25,000 and radiolocation equipment about $25,000 a system.

Rarely, if ever, are all types of equipment carried in a single plane. Usual complement would be a radio altimeter, magnetometer and counter plus associated recording equipment.

Radar altimeters chart topography. Photographic Survey Corp. of Canada has included one in a surface profiler accurate within 15 feet. New developments are expected to bring 5-foot accuracy.

Nonprofessional prospectors add to the sales of equipment principally in radiation detectors. Professional interest in uranium is subsiding. The AEC last year stopped its aerial exploration.

While dollar volume here has declined from $3.5 million in 1954 to $2 million in 1956, unit sales are steadied by vacation prospectors.

Geiger counter prices have been chopped to as low as $20 in the past two years. Scintillation counters can be had for $250. Free AEC patents have brought over 20 firms into a highly competitive field.

At least one firm is bidding for a larger share by transistorizing its counters. Weight is halved partly because transistors need only power given by flashlight batteries.

Technical DIGEST

• **Vertical** speed transducer for aircraft and missiles gives relatively high output voltages proportional to rate of climb or descent up to 25,000 fpm. Differential pressure-sensing element serves as capacitive voltage divider in a-c bridge circuit packaged by Trans-Sonics, Inc., Burlington, Mass.

• **Lovotron,** a low-voltage triggertron for rapid switching of single-pulse currents up to 500,000 amperes, is announced by Air Force Cambridge Research Center. It's for use in testing magnetrons, generating high-intensity light flashes, and generating surge currents.

• **Ultrasonic** generator on wrist of factory worker produces inaudible sound. Vibration is picked up by three microphones to give new three-dimensional picture of movements of hand for time-and-motion studies. Doppler effect is utilized. Developed at Washington University, St. Louis, system is called Unopar.

• **Neutron** detector having dynamic range as great as 2,000 to 1 has been developed at MIT under ONR contract. Detector uses moving-armature microphone to measure differential acoustic pressure generated within ionized gas of chamber when 400-cps a-c field is applied. Chamber uses argon gas and enriched boron lining.

• **Two** moving pickup heads replace some 60 fixed heads on magnetic memory drum of Northrop's new digital computer. Heads are on a carriage that moves length of drum and back in about 2 seconds for recording or reading each of 64 channels. Storage is 2,000 words.

• **Bismuth** telluride shows promise as semiconducting compound for thermoelectric cooling. Tests at Batelle give maximum temperature differential of about 70 C when current is sent through junction in reverse of thermocouple action. Potential uses include spot cooling of electronic components.

• **High-purity** silicon window panes and lenses for missile infrared domes permit passage of heat rays from objects at below-freezing temperatures. New Raytheon material permits heat-seeking missiles to home on ground targets, gliders or glide-bombs that have no exposed heat sources. Mechanical strength is said to be excellent.

• **Current-operated** cold-cathode tube, developed by Hivac Ltd. for electronic telephone exchanges, has movable trigger electrode of magnetic material. To fire tube, current is sent through relay coil mounted alongside tube, causing trigger electrode to move closer to cathode and start conduction.

Computer Rations Nile Waters

- **Sudan seeks computer's help in calculating Nile water storage**
- **Machine figures ultimate irrigation and power needs for 7 nations**
- **Data will suggest sites and sizes for dams and reservoirs**

AN ELECTRONIC computer is in the middle of one of the complex political problems of the Middle East—regulation of the Nile River for irrigation and hydroelectric purposes.

It may show that electronic technology can solve a problem previously approached politically.

An IBM 650 in London is calculating the ultimate irrigation needs of nations that want the Nile's benefits. It figures locations, size and operation of future reservoirs and dams.

Sudan tossed its Nile problems to IBM World Trade Corp. last year. Calculations for the irrigation side of the project are nearing completion, and the hydroelectric aspect will begin soon. All calculations may be finished by the end of the year.

Sudan has not as yet announced any conclusions. Previously, she had disagreed with the Egyptian Aswan High Dam plan for which the U.S. offered and withdrew $1.3 billion in aid.

A modified Aswan project, said a 1955 Sudan report, might be part of an overall Nile Valley plan, "but it will take some time to work out this plan and there can be no certainty until the calculations have been finished."

Use of the calculations in constructing irrigation projects and dams will, of course, require agreements between all seven countries concerned. Egypt's attitude toward the calculations is likely to affect a cooperative settlement of the Nile problems.

A spokesman for Egypt's UN delegation, however, told ELECTRONICS that his government is study the possibility of a computer solving problems of water storage on the Nile.

One political problem the computer may help solve: Egypt and the Sudan both believe they can use more water than would ordinarily become available. Egypt concedes less than half the water requirement claimed by Sudan. The computer may establish that much more water will be available for sharing through various projects.

Some factors the computer considers are:

Best locations for reservoirs (where evaporation losses are lowest), if this doesn't conflict with other factors; working arrangements for all possible storage sites, including volume of water to be released in any month through the dams' sluice gates.

In effect, the computer is working out effects of all combinations of dams, in all reasonable combinations of water supply and operation. This involves four existing dams, eight or ten proposed dams and a 190-mile stretch of canal proposed to reduce losses in a swampy region of the Upper Sudan.

Weather and water flow aspects of the problem involve calculations of effects of river discharges and gage levels at 30 points. Data used is based on 48 years of month-to-month records.

Also being weighed are variable factors such as dam heights and uses to which the water is put. Sudan and Egypt are primarily interested in irrigation but have a secondary interest in power; Ethiopia, Kenya, Tanganyika, Uganda and Eritrea see power as their primary need.

Given the necessary information, the computer takes 13 minutes to trace the 576 months of Nile history, calculating water levels at 30 points. The calculations would otherwise take months.

Suitcase Ultrasonics

Portable ultrasonic thickness gage by Magnaflux weighs 16 pounds with battery. Operator is reading aircraft skin thickness as check on corrosion

If it's worth Engineers' time . . .

. . . It's worth Engineered Cable

Belden microphone cables

Whatever the installation, whatever the requirements, there is an accurately rated Belden Microphone Cable built for the job.

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WIREMAKER FOR INDUSTRY
SINCE 1902
CHICAGO

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1001 WIRES FOR EVERY ELECTRONIC NEED

Big dish tracks sun as . . .

Radio Sextant Foils Fog

Picks up thermal radiation from sun;

Military units are now operating.

Commercial market: over 15,000

SHIPS that sail fog-bound seas can look forward to a precise all-weather device for celestial navigation.

On sunless days, some ships must rely on dead-reckoning navigation. One day they may be equipped with all-weather radio sextants, such as Collins is completing for Navy's floating electronic lab, USS *Compass Island* (ELECTRONICS, Jan. 20, 1957).

Collins' radio sextant supplements the optical sextant by providing the same type of information on an all weather basis. It automatically tracks the sun and moon through reception of extremely faint thermal radiation.

The sextant's antenna resembles that of a typical azimuth-elevation gimbaled radar set in size and appearance. It is mounted on a stabilized platform built by Norden Laboratories and is enclosed by a BirdAir Structures inflated radome. Operation will be largely automatic, with automatic printout of navigational data. Provision is also made for direct input of data to a navigational computer.

Collins' radio sextant work is still exclusively military: one radio sextant already installed on the USS *Curtiss*, presently in the Antarctic, and one airborne radio sextant for the Air Force. Need for such a device by commercial vessels—world fleet of merchant ships alone exceeds 15,000—may provide a future market.

Three types of this equipment are possibilities: all-weather equipment with accuracy equal to optical; the same with precision greater than optical; and equipment capable of taking readings on the moon.

Plan Home Theater Net

TV STUDIO equipment makers will keep their eye on Bartlesville, Oklahoma. What happens there after late July may well signal boom time for their gear.

For outlay of $300,000 Bartlesville will have an electronic home theater. One thousand homes will be connected to the Lyric, recently a vacant movie house. Four thousand are expected within a year. For $9.50 a month these homes will receive 13 current motion pictures, over three unused tv channels, a variety of second runs and local interest programs. Cost of hooking on: nothing.

Vumore Co., subsidiary of Video Independent Theaters (owners of 150 Southwestern theaters), is conducting the experiment. "We have every reason to think this move will be an economic success," says Video Independent v-p C. O. Fulgham.

Although FCC permission is not needed, city government okay to run cable wire along and across streets is. Bartlesville said yes in exchange for one percent of gross receipts. Vumore has 30 other town grants throughout Southwest, including Enid, Okla., Lubbock, Tex., Albuquerque, N. M.

Camera chains, capable of picking up 35 mm films run in the neighborhood of $30,000. Other equipment used; coaxial cable, messenger wire, telephone pole hardware, 2-3 amplifiers per mile. Bill for all these comes to about $3,000 a mile.

Fulgham thinks "order lots of 500 cameras should bring cost to where a theater in a town of 10,000 can afford to get in."

HELP Helps Tech Students

MASSACHUSETTS PRIVATE enterprise has created the statewide Higher Education Loan Plan (HELP).

HELP is expected to:

- Help supply sorely needed engineers to electronics.
- Set off moves for similar plans in other states.

Plan enables students to borrow money to finish college. Eligible students get loans from their own banks at prime interest, repay after graduation.

Eighty percent of loan is guaranteed by Massachusetts Higher Education Assistance Corp., which formed HELP. Money for MHEAC was contributed by corporations, foundations and individuals.

Bay State legislature passed a special charter allowing formation of MHEAC. Massachusetts Bankers Association backs this plan for making commercial credit resources available for student loans.

America's Most Complete Line of Instrument Calibration Standards!

"Simple to Operate.. yet EXTREMELY ACCURATE"

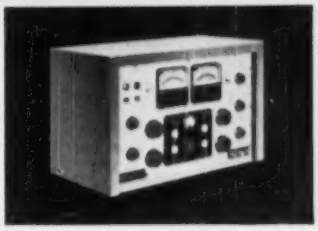
FROM ACTUAL EXPERIENCE BY
Test Engineering Activity
RCA TUBE DIVISION
HARRISON, NEW JERSEY

For three years the life test laboratory of the Harrison plant of the RCA Tube Division has been using the RFL Models 262B and 454B Instrument Calibration Standards to periodically check the accuracy of over 2,000 meters employed to measure receiving tube characteristics prior to shipment. Element currents, amplification factor, plate resistance, transconductance, emission, etc. are measured to fine tolerances.

According to Mr. Tomalesky, manager of the laboratory, "both Standards are in operation eight hours a day, five days a week. Only two maintenance calls have been necessary in three years. The 0.1% accuracy of Model 262B satisfies our requirement for DC meter standardizing. These two Standards have eliminated the problems associated with previous methods."

The advantage gained by in-plant calibration of electrical instruments using these console type Standards, which encompass the full range of testing instruments, under controlled laboratory conditions, goes beyond mere convenience. Their ease of operation, consistent calibration and high accuracy over wide current and voltage ranges are impossible to duplicate using individual testing equipment which must be moved from job to job throughout a manufacturing plant.

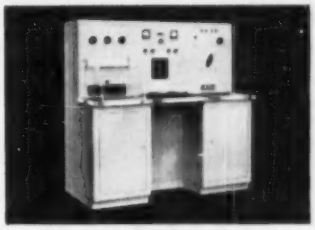
In addition to accuracy, each RFL Standard has many features which make rapid calibration procedure possible. Where many instruments must be tested, it can be demonstrated that an appreciable cost saving over older calibration methods will soon result.



Model 829

Portable unit calibrates both AC and DC meters over ranges from 0.25 millivolts to 2000 volts and 2 microamperes to 20 amperes. Direct reading accuracy of 1% (0.5% using charts supplied). Frequency from 50 to 400 cps depending on line frequency.

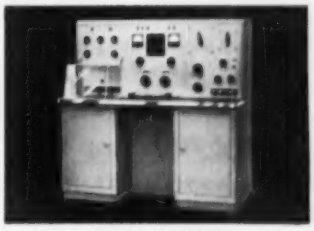
Net price $2,650. f.o.b. Boonton, N.J.



Model 261B

Calibrates all types of AC meters to direct reading accuracies of 0.5% (0.25% using calibration charts) over frequency range of 50 to 1600 cps. Current range from 1.5 milliamperes to 200 amperes; voltage range from 75 millivolts to 1500 volts. Output of electronic power oscillator has less than 5% total harmonic content at 60 cycles.

Net price $9,250. f.o.b. Boonton, N.J.



Model 262B

Calibrates DC electrical measuring instruments to direct reading accuracies of 0.1% (0.05% using calibration charts) through voltages ranging from 1 millivolt to 1500 volts and currents ranging from 1 microampere to 150 amperes.

Net price $15,600. f.o.b. Boonton, N.J.

Write for technical data and application information.

RFL

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LABORATORIES, INC.
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Conference of Microwave Associates representative with system manufacturer's engineering and purchasing personnel establishes magnetron specifications and performance requirements.

Facts presented to Vice President, Julian Pathe, who heads up Magnetron R & D by Senior Project Engineer, Rudy Prentice, determines most expeditious method of attack on the problem.

Moving fast in Magnetrons...

Microwave Associates: A small company with big ideas is winning an ever-growing share of the magnetron market by expediting development and production of special designs

Take 253 skilled employees . . . give them up-to-the-minute engineering, production and testing facilities in a modern, 50,000 square foot plant . . . back them up with the financial strength of ABC Paramount Theatres, Inc. and Western Union Telegraph Company . . . and a small company can do big things . . . fast.

Small-company flexibility is the reason why Microwave Associates moves fast from initial problem through the design, development and production stages to final delivery.

Large-corporation stability has attracted the top scientific and engineering talent required for developing the right magnetron design for each specific microwave system requirement. This unique combination of speed and quality explains why increasing numbers of engineers and buyers are over-coming time and design obstacles by turning to Microwave Associates for their magnetron requirements.

If getting the right magnetron fast is important to you, write or phone: Julian Pathe, Vice President

MICROWAVE ASSOCIATES, INC.
Burlington, Mass. • BUrlington 7-2711

A prototype has been developed, tested and customer approval received prior to full scale production. Here, inspector checks precision tube component during assembly.

Final assembly by skilled experienced assemblers keeps magnetrons flowing in volume toward production testing.

Final testing of production magnetrons. Every tube is tested for operating characteristics in accordance with customer and military specifications.

Air Freight Lowers Costs

Savings can offset higher rates
As speed reduces size of inventory
And service spreads good will

Net savings are possible for electronics firms through use of air freight. These benefits are largely possible through air freight's ability to shorten replenishment cycle, reduce inventory needed to fill orders.

Conclusion comes from Harvard Business School study. It indicates air freight's speed can save costs exceeding air freight's cost over that of other shipping means.

Study notes that companies likely to benefit have products with relatively high value per pound, like electronic equipment.

Analysis of total distribution costs of a manufacturer of receiving tubes, in eastern U.S., was part of the study.

If this manufacturer had shifted to air freight, distribution cost savings would have been almost double the extra cost of air freight. Inventory cost savings from lower interest, taxes and insurance premiums amounted to $154,000, compared with $79,000 additional transportation expense. Also, $1.8 million of capital, previously tied up in inventory, would have been released.

Reasons for gains were lower minimum and maximum inventories at regional warehouses because of shorter replenishment cycle.

Aside from air-freight considerations, study focuses attention on need to reexamine costs of physical distribution. Because this area has often been neglected by management, it offers fruitful rewards.

Mechanization Shares Costs

Nearly 200 firms are pushing production equipment and materials for our industry. The equipment minimizes handwork and setup time.

One manufacturer has a punched tape-programmed, printed-board assembly machine. It automatically positions boards, drills holes, inserts and clinches up to 24 components, sockets, eyelets or terminal pins. Pushbutton controls can change drilling and insertion steps. Same firm offers an automatic lead looper.

Coil-winding machines are subject of continual improvement. One example keeps coil form stationary and brings it to winding spindle on turntable or belt. Stationary feature allows introduction of other production steps without stopping winding of succeeding coils or cutting the wire.

A wire-wrap machine recently introduced wraps leads of pigtail components around terminals. A tight fit eliminates soldering and hence heat which might damage delicate components.

Now on the market is a resistance soldering iron which uses a thyratron relay circuit to time soldering heat. Iron can be held in a jig and timing started by a foot pedal, leaving operator's hands free.

A mass spectrometer has been designed as an automatic tube-leak tester. It has electrically interlocked valves to allow operation by unskilled personnel.

Plastic makers are offering several new products. One firm offers Teflon in sheets up to ⅛ inch thick. A representative says Teflon will be widely used in printed circuits in two to five years, despite high cost, as frequencies and temperatures mount.

Another company offers zipper-closed plastic tubes as a substitute for cable lacing.

2J42H:
8 kw, fixed tuned, high altitude, X-Band, pulsed.
MA 207:
60 kw, fixed tuned, ruggedized, Ka-Band, pulsed.
MA 215:
40 watts, fixed tuned, X-Band, pulsed. Light weight (20 oz.), high efficiency.
6229:
1 kw, mechanically tunable, X-Band, pulsed.
6229
MA 213:
5 watts, pulsed or 1 watt CW, fixed tuned, ruggedized, X-Band, anode voltage only 450V.

. . . and more to come!

Since 1951, Microwave Associates has produced magnetrons to meet many different microwave system requirements. This rich experience is available to you through one of the top scientific and engineering groups in the field.

NEW MAGNETRONS

MA 213 and MA 215 are new magnetrons that offer the advantages of high efficiency, light weight, extra ruggedness and very low voltage supply operation. Other X-Band and Ka band tunable magnetrons are under development.

If your microwave system requires high quality performance, write or call for full information, close cooperation and fast service.

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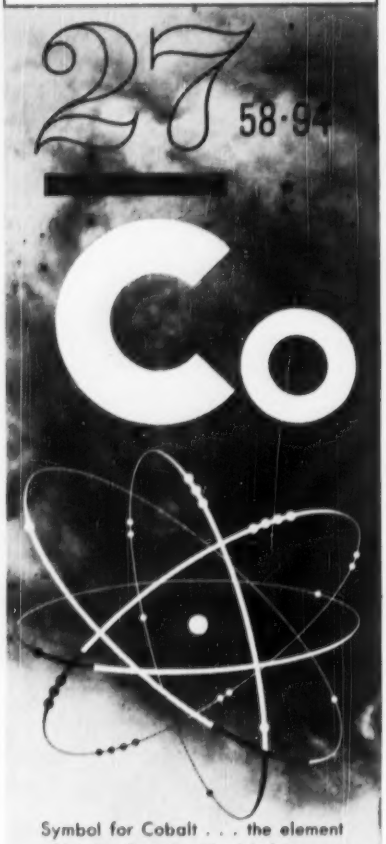
Burlington, Mass., BUrlington 7-2711
Want more information? Use post card on last page.

ACCEPTED SYMBOLS



Symbol for Cobalt . . . the element which is alloyed with nickel to produce certain types of filament wires for electron tubes.

Just as Co is the accepted symbol for Cobalt, so Tung-Sol represents the highest quality production of electron tubes to volume requirements. This outstanding capability is a major reason why Tung-Sol is America's largest independent manufacturer of electron tubes.

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Manufacturers of Automotive and Electronic Components.

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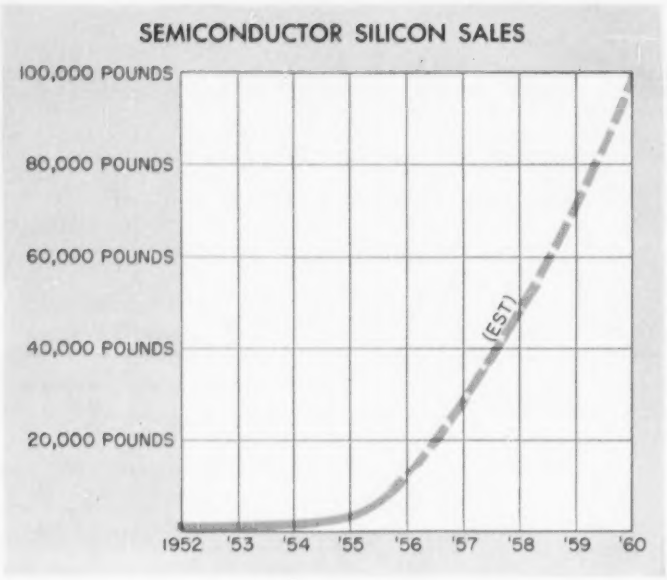

Sales climb rapidly as . . .

Silicon Price Drops

Semiconductor makers can choose grades; 100,000 pounds 1960 consumption seen. Solar cell silicon is cut $50 a pound

SEMICONDUCTOR grade silicon shows signs of another price drop. DuPont and Sylvania are already chopping price of solar-cell grade from $150 to $100 a pound. Price last year was $180 a pound.

DuPont is abandoning its $320 a pound grade (it cost $430 in 1952). Firm now offers three grades at $160 to $360 a pound, depending on amount of residual boron in it.

Sylvania is sticking to one grade at $320 a pound. Texas Instruments offers regular and higher priced grades. These two firms grade silicon by resistivity.

Supply situation is good and getting better. Early next year, DuPont will have a new plant refining annually 50,000 pounds of semiconductor-grade silicon and 20,000 pounds of solar-cell grade.

Sylvania, while not revealing capacity, says it will double production by July and has tentative plans to double again by 1958. Texas Instruments is concentrating this year on processing improvements to increase yield. Aries Laboratories estimates 1956 silicon consumption at 10,000 pounds, compared to Sylvania's figure of 10,000 to 12,000 pounds. Aries predicts sales of 100,000 pounds in four years.

Platinum Dips to $93

PLATINUM prices dropped $11 an ounce early this year—from $104 to $93. Wholesalers, while refusing to forecast future prices, say current savings will be passed along to consumers in electronics and other industries.

Average prices remained firm around $104 an ounce through 1956. Heavy European selling in

January and February forced the market to $98. Russian selling in Europe chopped off another $5 in March.

Foreign sources largely rule the United States supply of the platinum group of metals. Bureau of Mines estimates that of 927,000 ounces produced in the world in 1956, only 24,000 ounces originated in the U. S. The United States, however, consumes half. Adequate supplies are expected to prevail through 1957.

Of the total supply, 590,000 ounces is platinum, 310,000 ounces is palladium and 27,000 ounces is rhodium, ruthenium, osmium and iridium. Platinum, which played a large part in development of radio and x-ray tubes, is important to electronics.

Tungsten-platinum is used in radar tube grids. Platinum-clad tungsten and molybdenum wires are widely used in tubes requiring close spacing of electrodes. Other uses include oxide-coated cathodes, contact platings, thermocouples and leads for thermistors and some types of rectifiers.

Electrical and electronic uses take about 11 percent—45,000 ounces—of total consumption with bulk used for plating contacts and for phono needles.

New England in Manpower Drive

NEW two-pronged drive is underway in New England to keep engineers home and lure back those who have left.

The New England Council has published a directory of college manpower available to industry. The 56-page, pocket-size booklet contains: location of educational institutions, number of graduates in major fields, dates they may be interviewed. Called "New England College Manpower 1957," the booklet was prepared by Cambridge Publications.

Second prong of the drive is creation of Employers' Services of New England, an organization financially supported by a group of employers. More than 35 electronics firms are in the venture. Nationwide advertising includes a "Come back to New England" theme.

...in PRINTED CIRCUITRY
there is no substitute for
RELIABILITY...!
.031" MINIMUM LINE WIDTH RECOMMENDED
.031" MINIMUM SPACING RECOMMENDED
.0015" MINIMUM CU. WALL IN PLATED HOLES
SUFFICIENT FOIL AROUND HOLES

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WE ARE GEARED TO THE FIXED IDEA THAT

PROPER DESIGN PLUS PRECISE CONTROL

(We give you assistance FREE) (Our quality control system invites your inspection)

MEANS RELIABILITY

(This we guarantee!)

SOME OF THE AREAS in which exacting control and in-process inspection are applied follow:

1) *Master Drawing through printing:*
(a) Best camera and photo composing equipment available to the industry.
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(c) Temperature and humidity controlled printing areas.
(d) All printing operations checked with glass masters for maximum accuracy.

2) *Plating and Etching*
(a) Control laboratory checks solutions daily.
(b) Ease of solderability assured by maintaining chemical cleanliness and plating purity.
(c) Daily humidity chamber testing to insure against contamination of base materials — both electrical and chemical inspections are performed.
(d) Plated holes are sectioned and photo-micrographed to insure adequate plating thickness and continuity.

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Electronics Spending Climbs

1961 will rise 50% over '56

But all defense will rise 10%;

5-to-1 ratio will hold through '65

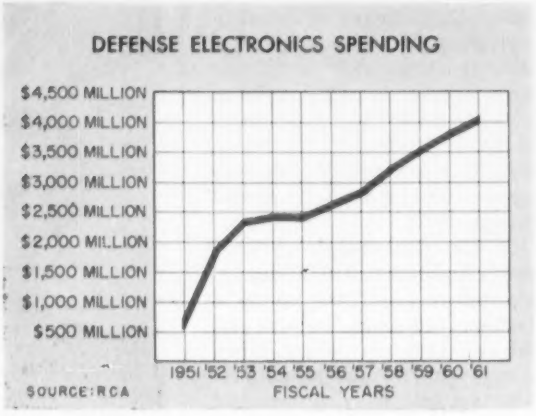
ELECTRONICS industry is winning more of the defense dollar, says RCA's economic planning group. Total 1961 defense spending will be up 10 percent over 1956. But electronics share will rise 50 percent.

This five-to-one climb ratio—due to increasingly important role electronics plays in new complex weapons systems—is expected to continue through 1965. Then total defense spending will be 20 percent greater than current spending, with military electronics double 1956.

Continuance of trend is borne out by DOD's constantly increasing emphasis on research and development. Newer weapons use more electronics equipment. Specific R&D requests: $600 million in 1951, $2.4 billion in 1956, $1.7 billion already requested for 1958.

Defense electronics spending shot upward during 1951-1953 because of the Korean war.

Appropriations were cut in 1953 while the armed forces studied weapons' capability and began to shift from conventional to nuclear weapons. However, backlogs kept expenditures up through 1955.



Barring an all-out war, defense appropriations, backlogs and spending trends should stabilize by 1958. Looking at the industry as a whole:

- Electronics industry is growing about 2½ times as rapidly as the economy as a whole.

- By 1965 the electronics industry will attain a volume of $21 billion, double 1956. Sylvania predicts $22 billion by 1966.

MILITARY electronics

- **Portable scales** which weigh an airplane and automatically determine its center of gravity have been developed by ARDC. After placing a scale beneath each wheel, electronic load cells measure compression. Electrical data is transmitted to computer which simultaneously determines weight and center of gravity.

Scales and computer were built by Baldwin-Lima-Hamilton and Continental Electrolog, respectively.

- **Loewy Hydropress** division of Baldwin-Lima-Hamilton will design, build and install at AFMTC, Cocoa, Fla., large ship-motion simulator for evaluation of Navy's Fleet Ballistic Missile.

Ship's motion will be simulated through electronic servomechanism. Magnetic tape recordings taken at sea will be fed into testing device. Amount of contract: $2 million.

- **Force sensors** for control stick, control wheel and rudder pedal that allow pilot to override autopilot in flight are being developed by Lear. Sensors measure force exerted by pilot and translate it into electrical command signals for autopilot. Flight tests have been made with F-100, F-84, Mystere IV and C-45.

- **GE's** closed-circuit color tv will be used by Army at Missile Test Center, Cape Canaveral, Fla., for ringside viewing of missile launching. Color of flash and flame at take-off reveals important flight characteristics heretofore difficult to observe.

CONTRACTS awarded

Instruments for Industry has a $215,000 contract increase with Signal Corps for developing countermeasures sets, AN/MLQ-8.

Stavid Engineering's contract with Navy for producing a guidance system for the submarine-launched Regulus has been supplemented by new contract for test equipment for the system. Tests can be made without firing missile.

Tally Register will build a $90,000 high-speed data-reduction system for Navy to process test-flight information from aircraft and missiles. Work on a $150,000 contract for Martin, already given green light, is underway.

General Instrument gets contract from Rome AF Depot for cloud-

WESCON is big business!

San Francisco's Cow Palace will be the center of West Coast electronic activities during August 20-21-22-23. The 1957 figures are expected to exceed on all counts the phenominal growth in attendance and number of exhibitors at the 1956 Show:

Total number of booths	711
Total number of exhibitors	561
Total attendance	31,671

We'll be there in BOOTH 2415

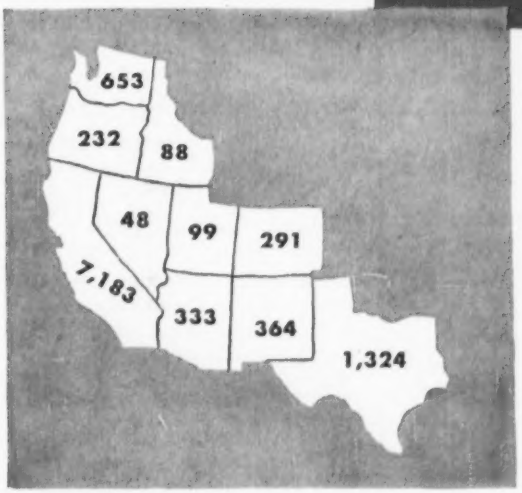
Stop by and see the **electronics** representative

and the market place is the August 1st issue of...

electronics

A McGraw-Hill Publication, 330 West 42nd Street, New York 36, N.Y.

ABP ABC



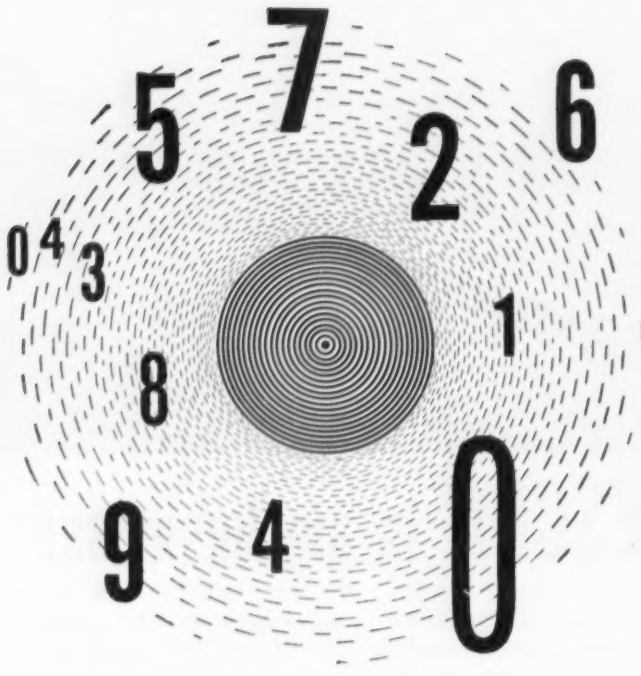
electronics circulation in the surrounding states that drew over 80% of the people attending WESCON amounts to nearly 10,000 *paid* subscribers – more than any other publication serving the electronic field in the area!

Exhibitors at WESCON will use the August 1st Technical Edition to announce booth numbers and preview their products – as they have been doing since 1949 when the Show was first held.

Non-exhibitors will reach out to **electronics** 46,000 paid subscribers for representation in the August Show-in-print.

Schedule your display of products in August **electronics** now.

CLOSING DATES: Complete plates—July 1; Copy to set—June 25



analog-to-digital

KEARFOTT
ANALOG-TO-DIGITAL
CONVERTERS

TRANSLATE SHAFT ROTATION INTO ELECTRICAL AND VISUAL DIGITAL FORM

KEARFOTT DIRECT DRIVE ADAC is a shaft-positioned analog-to-digital device utilizing coded drums, interconnected by high-speed odometer type gearing to provide an electrical impulse representing shaft position. Available for a wide variety of capacities and codings.

KEARFOTT MECHANICAL COUNTERS are used to provide precise visual presentations of angular position, latitude, longitude, or any information imparted by shaft rotation. Both types are designed to provide long life at maximum slewing speeds up to 1800 R.P.M.

KEARFOTT LATITUDE COUNTER

KEARFOTT ANGLE COUNTER

KEARFOTT ADAC (21P) 32,768

KEARFOTT ADAC 0° TO 359.9°

KEARFOTT COMPONENTS INCLUDE:
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Send for bulletin giving data of components of interest to you.

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South Central Office:
6211 Denton Drive, Dallas, Texas
West Coast Office:
253 N. Vinedo Avenue, Pasadena, Calif.

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GENERAL PRECISION EQUIPMENT CORPORATION

height radar sets, AN/GMQ-13A, amounting to $670,350.

Stewart-Warner will provide Rome AF Depot with 4,532 radio transmitters, T-282/GR, totaling $3,177,155.

IT&T will sell radio transmitters, AN/ARN-21 to Navy BuAer. Price: $18,965,359.

Admiral has $1,038,265 contract with Navy BuAer for radio receiver-transmitters and mountings, ARC-55.

G. Felsenthal and Sons will sell air navigation computers to AMC totaling $146,540.

American Machine and Metals has $553,830 contract with AMC for pressure transmitters, type MH-5, for aircraft.

Thomas A. Edison gets contract from AMC for pressure transmitters, type MH-3, totaling $664,733.

Eclipse Pioneer, division of Bendix gets $2,355,822 contract with AMC for indicators, ID-387/ARN, used with AN/ARN-14 radio receiving sets.

Sperry has $1,150,000 contract with AMC for MA-2 automatic pilot systems for B-52 aircraft.

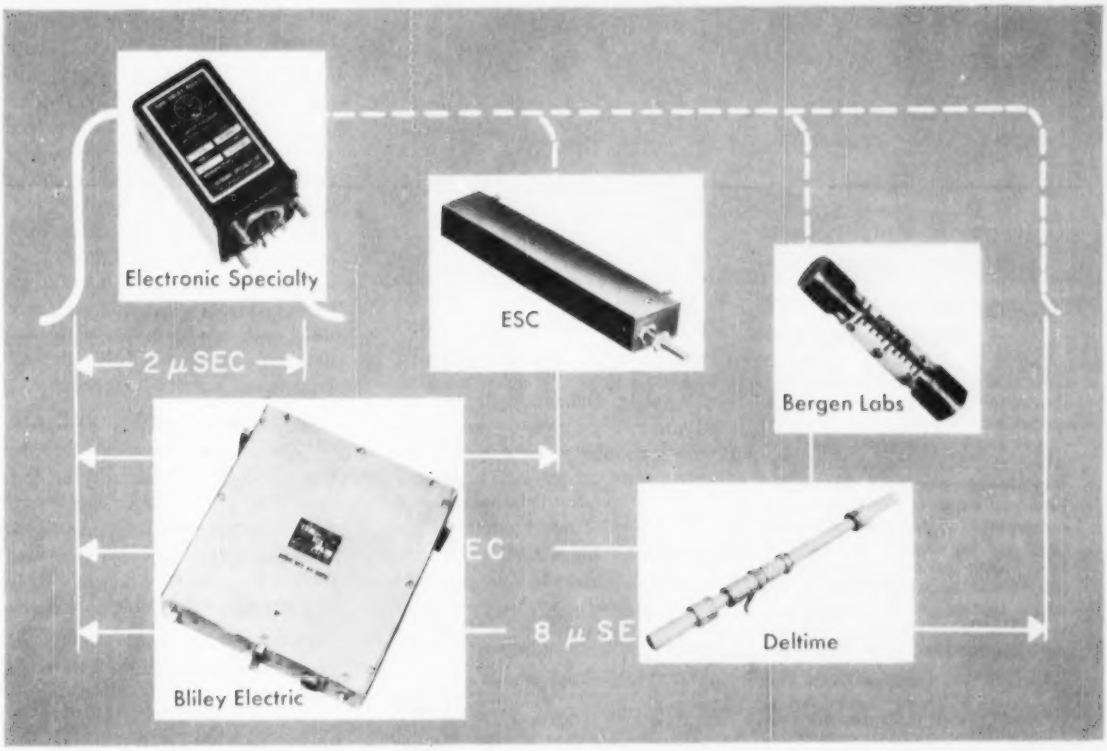
RCA gets $1,586,176 contract with AMC for product improvement of command communications set, AN/ARC-34.

Westinghouse will sell 40 kva generators, voltage regulators and control panels for B-47 and B-52 aircraft. Total: $2,704,774.

Southwestern Industries gets subcontract from Convair for design and manufacture of pressure switches to be used in classified missile applications.

General Instrument gets three Signal Corps contracts totaling over $2½ million for radiosondes, dropsondes and power supply units for ground radio communications systems.

Timing Tops New Products



Delays, Timers Announced

TIMING is key to operation as well as essential to testing and maintenance of much electronic gear. Fixed delay lines available from **Deltime** (P1) cover the time range from 2 to more than 200 microseconds. Four basic types of circuitry are used in **Electronic Speciality's** (P2) time-delay relays. Delay line with time range from 100 to 1,000 microseconds is being produced by **Bliley Electric** (P3) for commercial memory channel units.

Called Chronisters, **Bergen Labs** (P4) elapsed-time indicators record time an electronic instrument or component has been in operation. Five continuously variable delay lines by **ESC** (P5) are intended for use in computers and radars.

Other Gear

PHOTOELECTRIC refractometers announced by **Phoenix Precision Instrument** (P6) can be used where refractive index is an indication of product quality, such as in chemical, pharmaceutical and petroleum processing. . . . **Mica Corp.** (P 7) is producing flushed etched circuits which are said not to creep above the surface of the laminate. . . . A complete line of miniature audio transformers is available from **Gramer Halldorson Transformer** (P 8) for use in transistorized circuits.

Continuously variable broadband attenuators offered by **Douglas Microwave** (P 9) for frequencies from 100 to 3,300 mc are said to have maximum insertion losses of one db in the 40-db unit. . . . Small quantities of silicon diodes are available from **U.S. Dynamics** (P 10) that are claimed to operate at temperatures up to 375 C. . . . Hand-type strippers announced by **Ideal Industries** (P 11) have been designed for use with Teflon-insulated wire.

Transistorized plug-in counting circuits are being produced by **Walkirt** (P 12) for use in telemetering, sequencing and counting gear. . . . Output of 4,500 amperes at 14 volts is delivered by a stack of selenium rectifiers marketed by **Radio Receptor** (P 13). . . . Transistorized d-c to d-c power supplies by **Arnold**

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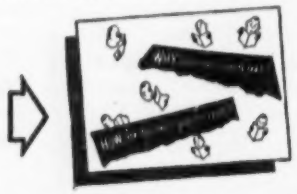

A copy of this quick-reading, 8-page booklet is yours for the asking. It contains many facts on the benefits derived from your business paper and tips on how to read more profitably. Write for the "WHY and HOW booklet." Room 2710.

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One of a series of ads prepared by
THE ASSOCIATED BUSINESS PUBLICATIONS

Magnetics (P 14) operate from 24-30 volts and deliver outputs from 25 to 1,200 volts d-c. . . . A line of test instruments offered by **Paco Electronics** (P 15) in kit form includes vtvm, tube tester, oscilloscope.

Coils for pi output or L-C output, interstage and oscillator circuits are announced by **Illumitronic Engineering** (P 16). . . . Gyroscopes have been designed by **Iron Fireman** (P 17) to measure roll and pitch for airborne fire-control.

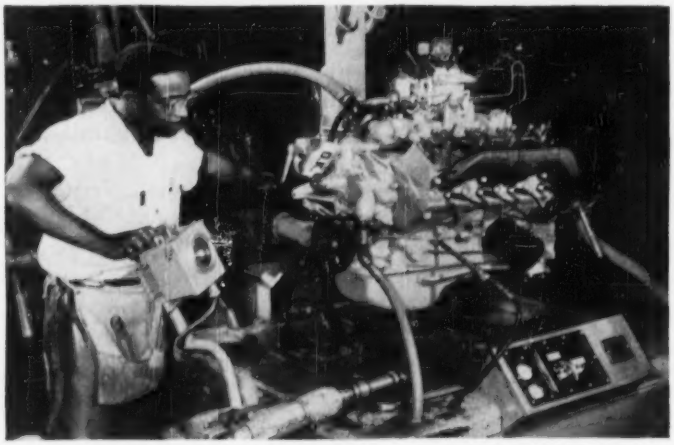
Blocking oscillators announced by **DuMont** (P 18) are ¾ inch cube and deliver 3-microsecond pulses with +6 volts to −3 volts amplitude. . . . Coolant pumps offered by **Applied Dynamics** (P 19) for airborne fire-control systems and coolant circulation in missile guidance systems are claimed to be leak proof. . . . A double-beam infrared recording spectrophotometer is announced by **Baird-Atomic** (P 20). . . . **Beva Laboratory** (P 21) has available two power supplies for use with proportional counters and ionization chambers.

A rotating-cylinder viscosimeter featuring electrostatic restoring torque is announced by **Polarad** (P 22). . . . Pulse generators offered by **Electro-Pulse** (P 23) feature repetition rates up to 100 kc and variable pulse widths from 0.1 to 100 microseconds. . . . Crystal and oven packages are available from **Bliley** (P 24) for frequencies from 4 kc to 125 mc.

Applied Research's (P 25) uhf converter is said to have a minimum overall gain of 50 db in the 400 to 900-mc range. . . . A line of edge-lighted and plain knobs and dials offered by **Kerrco Products** (P 26) is said to offer high resistance to abrasion and to cleaning solvents. . . . Vibration of large electronic assemblies is possible with a vibration exciter designed by **Textron** (P 27) to produce a peak force of 15,000 lbs.

American Machine & Foundry's (P 28) portable transient analyzer measures, displays and records generator output voltage, frequency, waveform and power. . . . A camera designed specifically for recording oscilloscope presentations is offered by **Photographic Products** (P 29).

Delevan Electronics (P 30) announces r-f choke coils (0.15 to 22 microhenrys) that are 0.156 inch in diameter and 0.375 inch long. . . . Investigation of ultimate yields, elastic moduli, temperature effects



Curbing Engine Rock-and-Roll

Test-stand operator at Ford plant uses dual strobes to check engine for unbalance. Electronic circuits by International Research and Development Corp. compare front and rear vibration, indicating pulley and fly-wheel weight adjustment needed

is possible with **Allegany Instruments'** (P 31) high-rate tensile and compressive tester.

Operation in temperatures up to 350 F is claimed for **Gulton Industries'** (P 32) glass-coated ceramic capacitors for use in the oil and chemical industries. . . . **Technical Associates** (P 33) announces scintillation detectors designed for operation with scalers, rate-meters or gamma-ray spectrometer systems.

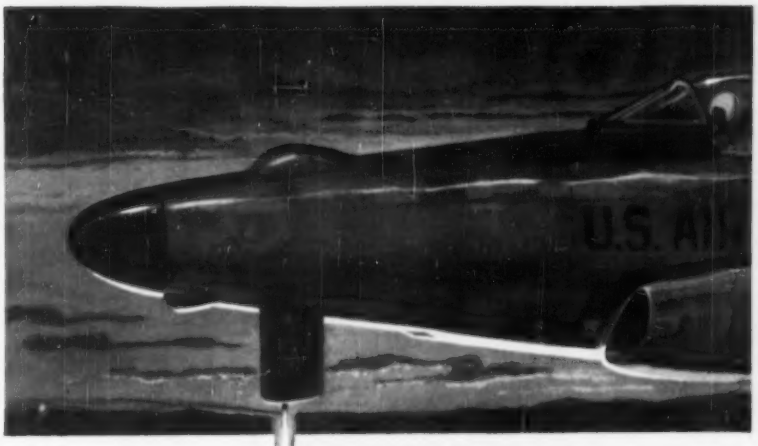
The type 2C39A tranmitter tube is offered by **Sylvania** (P 34) for use as an oscillator, frequency multiplier or power amplifier. . . . Choppers available from **Stevens-Arnold** (P 35) produce 120-cps square waves with 60-cps excitation. . . . Radar i-f amplifiers designed by **Lel, Inc.** (P 36) with center frequencies of 60 mc are said to withstand 20 g vibration at 2,000 cps.

Signal generators announced by **Polarad** (P 37) cover frequencies from 4,200 to 11,000 mc. . . . Temperature-altitude-humidity walk-in test chambers announced by **American Research** (P 38) provide work space of 7 by 10 by 8 ft. . . . Vidicon tv cameras made by **Kin Tel** (P 39) for studio or field use have a 7-inch picture tube mounted in the housing so operator can direct and focus image.

Dual-channel oscilloscopes offered by **Electronic Tube Corp.** (P 40) are said to handle frequencies from d-c to 15 mc. . . . D-c to d-c power converters announced by **Universal Transistor Products** (P 41) operate from 12 or 28 volts and deliver outputs between 120 and 2,100 volts. . . . **Geotechnical** (P 42) announces the Helicorder, which records analog data in the range from d-c to 35 cps.

Sound Apparatus (P 43) announces an improved sound-level recorder for sound, noise and vibration measurements. . . . The MN-24 and MN-25 audio power transistors announced by **Motorola** (P 44) are said to provide 30 to 35 db gain with less than 5 percent harmonic distortion when delivering 4 watts.

A line of electrostatic voltmeters is available from **New England Sci-**



Kentucky Windage at 650 MPH?

"Kentucky windage" is fine for an oldtime squirrel shooter at 60 yards. But how do you compute cross-wind allowance for high-speed jets aiming at fast-moving flank targets?

The compilation of firing tables required for cross-wind cannon firing is typical of the complex problems facing modern weaponeers. The special abilities of Thieblot Aircraft Company, a division of Vitro Corporation of America, in designing and manufacturing aircraft components and ordnance have made it a key member of the Army-Air Force team working on this difficult ballistics problem.

Thieblot's contribution was the design of a new ballistics data nose. Only a foot longer than conventional fighter noses, it carries a 20 mm. cannon with mount independent of the aircraft motion, four high-speed cameras, radar, and electronic equipment. With auxiliary ground controls this equipment "fixes" projectiles in time and space. This leads to greater protection for bombers and other combat aircraft through more accurate flank fire.

Thieblot Aircraft has also designed purge mat systems for jet trainers, a boundary layer control system, a nose-wheel steering mechanism, an inflight refueling unit, an escape reel for ditched aircraft and other equipment.

Like other divisions of Vitro, which specialize in atomic energy, weapons systems, extractive metallurgy and other advanced technologies of our new age, Thieblot makes tomorrow's technology available today.

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- Recovery of rare metals and fine chemicals
- Aircraft components and ordnance systems
- Ceramic colors, pigments, and chemicals

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with
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Typical marking problems solved by Markem include automatic color banding with up to six colors on wire lead components· printed circuit work on the new 90S screen process machine; base branding TV tubes in cartons and in sets; imprinting flat disc capacitors, ten foot lengths of rigid conduit, metal and glass tubes, odd-shaped automotive electrical parts.

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Here is a highly reliable mechanical modulator for use in servo systems and operational amplifiers—whenever low-level DC signals are converted to AC or synchronously rectified. It withstands all normally encountered environments; remains within specifications for 2,000 hours.
*Nominal drive is 6.3 volts at 60 CPS, operates 30-90 CPS.
*Hard alloy contacts are rated for 0-2 ma at 0-100 volts.
*Phase angle is 20 degrees; dwell time is 167 degrees.
*Noise is only 50 microvolts average.
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entific Instruments (P 45) for checking voltages applied to multiplier phototubes and tv tubes and for measuring static charges. . . . **Pyramid Electric** (P 46) announces a line of miniature capacitors for transistor radios, hearing aids, portable tv sets. . . . Miniature record playback systems are introduced by **Minneapolis-Honeywell** (P 47) for data acquisition during missile flight.

A 4-channel galvanometer amplifier is announced by **Allegany Instrument** (P 48) for use with strain gages, thermocouples and other transducers.

New Product Makers

P 1: Deltime, 608 Fayette Ave., Mamaroneck, N. Y.
P 2: Electronic Specialty, 5121 San Fernando Rd., Los Angeles 39, Calif.
P 3: Bliley Electric, Union Station Bldg., Erie, Pa.
P 4: Bergen Labs., 247 Crooks Ave., Clifton, N. J.
P 5: ESC Corp., 534 Bergen Blvd., Palisades Park, N. J.
P 6: Phoenix Precision Instrument, 3803-05 N. 5 St., Culver City, Calif.
P 7: Mica Corp., 4031 Elenda St., Culver City, Calif.
P 8: Gramer Halldorson Transformer, 2734 N. Pulaski Rd., Chicago 39, Ill.
P 9: Douglas Microwave, 252 E. 3 St., Mt. Vernon, N. Y.
P10: U. S. Dynamics, 1250 Columbus Ave., Boston, Mass.
P11: Ideal Industries, 5103 Park Ave., Sycamore, Ill.
P12: Walkirt, 141 W. Hazel St., Inglewood, Calif.
P13: Radio Receptor, 251 W. 19 St., New York 11, N. Y.
P14: Arnold Magnetics, 4613 W. Jefferson Blvd., Los Angeles 16, Calif.
P15: Paco Electronics, 70-31 84 St., Glendale 27, N. Y.
P16: Illumitronic Engineering, 680 E. Taylor St., Sunnyvale Calif.
P17: Iron Fireman, 2838 S. E. 9 Ave., Portand 2, Oregon.
P18: DuMont Labs., 750 Bloomfield Ave., Clifton, N. J.
P19: Applied Dynamics, 32 N. Main St., Natick, Mass.
P20: Baird-Atomic, 33 University Rd., Cambridge 38, Mass.
P21: Beva Lab., P. O. Box 478, Trenton, N. J.
P22: Polarad Electronics, 43-20 34 St., Long Island City, New York
P23: Electro-Pulse, 11861 Teale St., Culver City, Calif.
P24: Bliley Electric, Union Station Bldg., Erie, Pa.
P25: Applied Research, 163-07 Depot Rd., Flushing, N. Y.
P26: Kerreo Products, P. O. Box 228, Havelock Station, Lincoln, Neb.
P27: Polarad Electronics, 43-20 34th St., Long Island City 1, N. Y.
P28: American Machine & Foundry, 261 Madison Ave., New York 16, N. Y.
P29: Photographic Products, 1000 N. Olive St., Anaheim, Calif.
P30: Delevan Electronics, East Aurora, N. Y.
P31: Allegany Instrument, 1091 Wills Mt., Cumberland, Md.
P32: Gulton Industries, Metuchen, N. J.
P33: Technical Associates, 140 W. Providencia Ave., Burbank, Calif.
P34: Sylvania, 1740 Broadway, New York 19, N. Y.
P35: Stevens-Arnold, 22 Elkins St., South Boston, Mass.
P36: Lel, Inc., 380 Oak St., Coplague, N. Y.
P37: Polarad Electronics, 43-20 34th St., Long Island City 1, N. Y.
P38: American Research, Farmington, Conn.
P39: Kin Tel, 5725 Kearny Villa Rd., San Diego 12, Calif.
P40: Electronic Tube Corp., 1200 E. Mermaid Lane, Philadelphia 18, Pa.
P41: Universal Transistor, 143 E. 49th St., New York 17, N. Y.
P42: Geotechnical, 3712 Haggar Dr., Dallas 9, Tex.
P43: Sound Apparatus, Stirling, N. J.
P44: Motorola, 4545 W. Augusta Blvd., Chicago 51, Ill.
P45: New England Scientific Instruments, 166 Memorial Dr., Cambridge 42, Mass.
P46: Pyramid Electric, 1445 Hudson Blvd., North Bergen, N. J.
P47: Minneapolis-Honeywell, 10721 Hanna St., Beltsville, Md.
P48: Allegany Instrument, 1091 Wills Mt., Cumberland, Md.

F-M's Plexes, Simp And Multi

- **Simplexing nears FCC cutoff date**
- **56 f-m stations hold multiplex permits**
- **Five more stations are applying**

ONE of the ways f-m stations make an extra buck is being threatened by an FCC cutoff. On July 1, 30 f-m commercial stations may have to turn in their simplexing rights.

There's a strong possibility for a late save. One station has already asked the FCC for an extension of time for simplexing. Industry sources are betting extension may be given. FCC has no comment.

Whatever happens, however, the Commission has gone on record for multiplexing.

It all began two years ago on July 1, 1955. On that date FCC began giving Subsidiary Communications Authority (SCA) to f-m stations to practice multiplexing. That was also when cutoff date for simplexing was set.

Motive was to substitute multiplexing for simplexing. What bothered the Commission about simplexing was that it could be picked up on an ordinary f-m receiver.

Both multiplexing and simplexing have similar aims. A commercial enterprise such as restaurant, grocery chain, or railroad terminal can pay for and receive a special f-m broadcast signal. As it turns out, in many cases they buy background music empty of commercials.

However, multiplexing occurs when a f-m station transmits a subcarrier in part of f-m broadcast channel. It takes up about 15 percent of total channel. Programs on multiplex cannot be received by ordinary receivers; special multiplex receivers are needed.

With simplexing, signal can be received by ordinary f-m receiver. Simplexing can, however, be carried on only during nonbroadcast time. Subscribers, restaurants, stores, are furnished with special receivers which cut out or amplify commercials when station transmits inaudible supersonic or "beep" signal.

Simplexing costs little. Multiplexing costs a little more. A multiplex transmitter can be bought for $5,000. Operation costs, according to one estimate, about $25 a month.

Receivers for both systems are close in price. Simplex receiver runs about $125, multiplex about $150.

In June '56, 25 stations had simplexing permission; 30 had multiplexing permits. Six had authority to do both.

Today, 30 hold simplex authority. 49 have multiplex grants. Seven hold both. Five stations are now applying for multiplexing privileges.

FCC actions

• **Allows** development of telephone service in airplanes. On an interim basis AT&T can use frequencies 454.95 and 459.9 mc. Service will be hooked to nationwide public telephone service. Rates, depending on plane's location, will be $1.50 to $5.25 for a three-minute call.

• **Kills** 1951 proposal that broadcast and nonbroadcast licensees file with the Commission all patent holdings. FCC calls its own proposal "unsound administratively."

• **Will assign** to public garage licensee for base or mobile radio station either frequency 35.70 or 35.98 mc but not both in same area.

• **Intends** to make 8,476–8,745 kc exclusive for coast telegraphy. This is part of program of allocating bands exclusively to the maritime mobile service for use by coast telegraph stations.

• **Grants authority** to Alan Rosenson to transmit baseball games from Miami Stadium, Miami, Fla., to CKAC, CFCF, Montreal, Can.

• **Proposes** to add f-m channel 284 to Oxnard, Calif., substitute channel 236 for 284 at Santa Barbara, substitute 273 for 236 in Santa Maria.

• **Agrees** with its Canadian counterpart, Department of Transport, to amend the two-nation agreements. Three Canadian cities get channel switches. Also, no Canadian station can be less than 190 miles from an American station using the same channel.

STATION moves and plans

ABC network splinters off radio from television. American Broadcasting Company Radio Network becomes separate, autonomous subsidiary of parent company American Broadcasting-Paramount Theatres.

Corinthian Broadcasting is formed by investment banking firm J. H. Whitney & Co. to handle management policies for Whitney's four tv and two radio stations.

KANS, Wichita, Kans., installs new transmitter.

KOFI, Kalispell, Montana, plans new transmitter and increased power from 1 to 5 kilowatts.

WJAT, WJAT-FM, Swainsboro, Ga., is sold by Jack and Nancy Thompson to James R. Denny

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and Webb Pierce for $125,000.

WELL, Battle Creek, Mich., is sold by Federated Publications to Southern Michigan Broadcasting for $100,000.

KLCB, Libby, Mont., is sold to Frank Reardon for $19,000 by Lincoln County Broadcasters.

WKAI, Macomb, Ill., intends to install new transmitter, boost power.

KDAY, Santa Monica, Calif., is sold to Radio California by KOWL Broadcasting for $650,000.

KDMS, El Dorado, Ark., installs new transmitter, increases power.

KLPM, Minot, N. D., installs new transmitter.

WJEJ, Hagerstown, Md., installs new transmitter.

WEBY, Milton, Fla., plans to install new transmitter, increase power to 5 kilowatts.

WSPT, Stevens Point, Wis., plans to install new transmitter, increase power to 1 kilowatt.

WKNY, Kingston, N. Y., plans to change antenna-transmitter location, increase antenna height.

KEEN, San Jose, Calif., installs new transmitter, increases power.

WEZB, Homewood, Ala., wants to switch station location to Birmingham, Ala.

WEMB, Erwin, Tenn., plans lower power and higher antenna.

KBHM, Branson, Mo., increases power to 1 kilowatt.

KOSI, Aurora, Colo., installs new transmitter.

WJEJ, Hagerstown, Md., plans new transmitter.

WRC-FM, Washington, D. C., moves transmitter and studio, increases antenna height to 480 feet.

Missiles get glass noses as . . .

New Ceramic Emerges

Harder than steel, lighter than aluminum, Resists heat deformation up to 1,350 C. Opens up new military, civilian applications

NAVY missiles have broken—or will soon break—the sound barrier with glass. Guided missiles wearing glass radomes may be the answer to thermal shock problems now plaguing missile design engineers.

First pilot production of Corning Glass' new family of basic materials, Pyroceram, has been successfully completed. Regular production will begin soon after first full-scale melting next month.

Other applications for the new ceramic include: tube and semiconductor envelopes, resistor bodies, insulators, coil forms and power tubes for high frequencies and temperatures.

Harder than high carbon steel, lighter than aluminum and nine times stronger than plate glass, Pyroceram is essentially a crystalline material formed from a noncrystalline glass. It can be shaped while molten.

Possessing good high-frequency insulating dielectric properties, Pyroceram also resists thermal shock. There is very little loss of strength at temperatures up to 700 C. Deformation temperatures range up to 1,350 C.

Another new development in glass sealing methods has produced an all-glass color tv picture tube assembly. By using a frit seal that melts at low temperatures but sets at high temperatures, the glass panel and funnel can be assembled in a continuous baking process.

Also announced by Corning was photosensitive glass which may result in an aperature mask for tricolor tv picture tubes as well as high-temperature-resistant printed circuit boards.

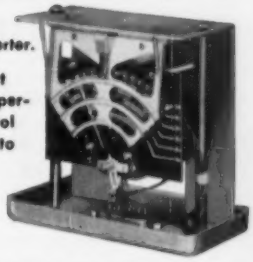
An intricate paper pattern may be used as a negative, held against the glass, exposed to ultraviolet light. The glass is then heated beyond red hot and immersed in hydrofluoric acid. A glass replica of the original paper pattern is produced.

Forming intricate patterns in this way lends itself to the field of electronic storage tubes and other devices. Glass screens with ¼ million holes per square inch have been made.

LIAD 2-in-1 Control Instrument

- Analog-to-digital converter.
- Multi-contact meter-relay permitting control action at up to 64 points.

4" x 2" x 4" approx.

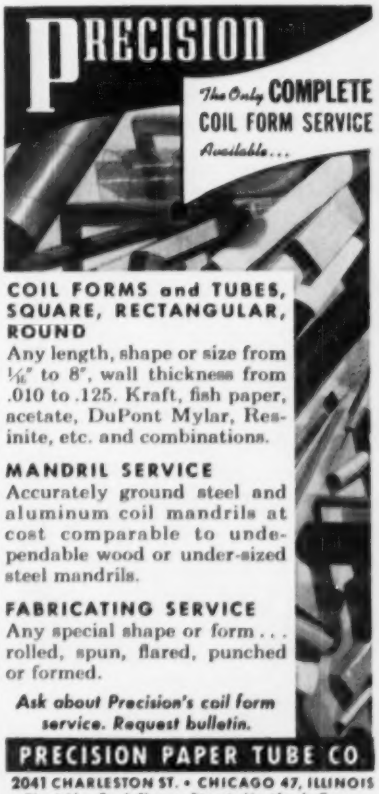


Applications for the LIAD (Low-Current-Analog-Digital) include telemetering, automatic testing, sorting, reading of maximum values, and accumulating quality control data.

It has a D'Arsonval movement, operating from any sensing element. A printed circuit scale replaces the normal dial. Read-out takes place when contacts under the pointer are clamped to the scale.

The LIAD converts low-level signals for transmission over great distances. Accuracy with a six-band scale is 1 part in 64. Fastest operation is about two times a second.

ASSEMBLY PRODUCTS, INC.
Chesterland 4, Ohio
Phone (Cleveland, O.) HAmilton 3-4436
West Coast: Box XX Palm Springs 4, California
Phone DHS 4-3133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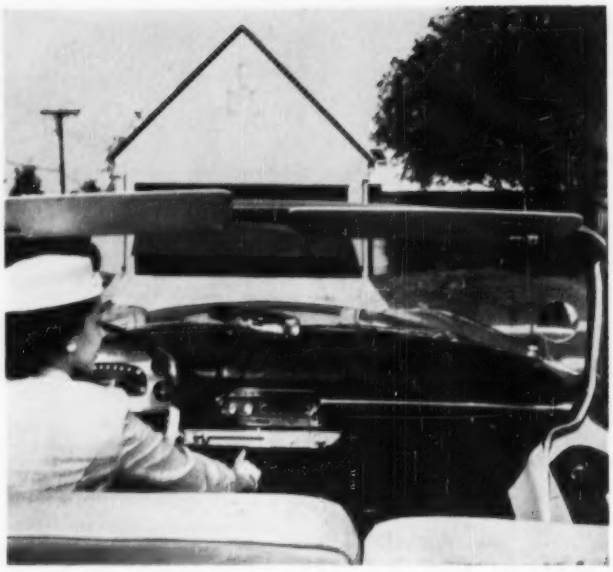

Pushbutton saves hike as . . .

Opener Opens Market

Manufacturer sees $2½-million-dollar market

And outfits a complete 50-home development;

Such extras sell homes, say builders

ELECTRONIC garage door openers are hitting the "big time" in the West. Packard-Bell foresees an annual market of $2½ million for a model which came out recently.

Unit sells for $199.95 installed. This includes low-frequency transmitter under car hood, dashboard pushbutton, receiver and electromechanical equipment for garage, and direct-wire pushbutton unit for garage wall. Second-car units go for $14.95.

Coding device in transmitter insures that a neighbor's garage does not open when you push your button. Each transmitter contains one of 42 different codes. P-B has equipped all 50 homes of a Compton, Calif. development. Contractors are among best sales prospects. "With all other factors equal," they say, "homes with extra conveniences are the ones that sell."

Manufacturers do not feel that door openers will set a trend to electronic homes. They see it as an addition to the built-in dishwasher and garbage disposal. It may, however, help gain public acceptance of such items as tv doorman, tv telephone and others.

Push Small Reactors

EXPANDING horizons for peaceful applications of atomic energy are evident from the progress being made by several companies in the field.

Three firms have order books ready for zero power training reactors. Aim is creating markets for large reactors by providing low-cost route into field.

Small reactors are designed for safe, speedy training of reactor per-

sonnel and to induce industry to take flyers into atomic processing experimentation. Sales potential is bolstered by AEC grants up to $350,000 for reactor training in schools.

Each sale will represent about $15,000 in reactor instrumentation, another $5,000 to $10,000 in related electronic gear.

Aerojet-General Nucleonics is making a 100-milliwatt reactor for visitors to operate. Price is $95,000, with installation and personnel training.

Atomics International Division of North American Aviation offers a five-watt model for $55,000.

Daystrom will produce Argonne National Laboratory's Argonaut. Output is 10 kw and $150,000 tag includes all services and training.

Parts list for Argonaut's regular control panel includes: two each strip chart recorders, d-c linear-amplifier high-level trips, counting channels (one with rate meter, both with scalers, linear amplifiers and pulse-height discriminators) and area gamma monitors; one each logarithmic-period power trip and master rotary switch.

Manufacturers look ahead and:

- Urge U.S. firms to retain export markets by going into partnership with foreign firms.
- Predict radiation food pasteurization overcoming odor and color drawbacks.
- Foresee neutron gaging maturing in 10 to 15 years.

Coordinates Box-Car Traffic

From San Francisco nerve center Southern-Pacific traffic managers now get data for shuffling box cars. New electronic computing system analyzes demand for cars, supply, and handling efficiency.

The technique uses a maze of data-processing machines attached to an IBM 650 magnetic-drum computer. The machines sort records on 70,000 freight cars rolling over 8,000 miles of track, from Portland, Oregon to El Paso. System serves SP in 11 Western divisions, after July 1 may extend to Texas and Louisiana.

Dead Pigeon!

Infrared Missile System Stalks Target for a Sure Kill

A missile's success in destroying a target hinges on the capabilities of its terminal phase guidance system.

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Exports Show Rise

Radio and tv reach $262.5 million;
Military gear swells 1956 total
But civilian equipment advances too

U. S. EXPORTS of radio and television equipment in 1956 jumped $54.1 million over the previous year led by military items. Total was $262.5 million.

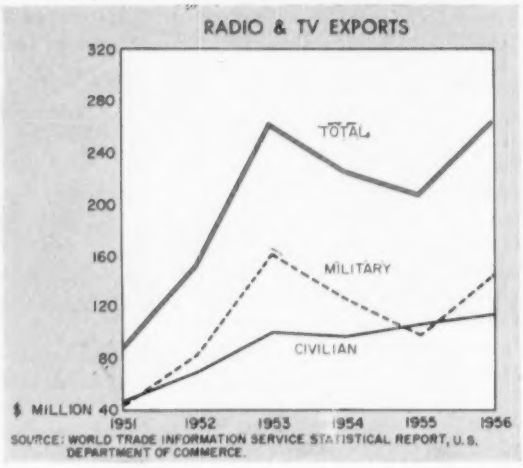
Military radio gear alone accounted for $146.7 million in 1956, up $46.5 million from 1955. Civilian radio and tv exports gained $7.6 million, amounting to $115.8 million.

The military and civilian total was $1 million short of the record $263.5 million export in 1953. Military radio equipment that year accounted for more than $160 million. Total military and civilian radio and tv equipment dropped to $226.5 million in 1954, then fell to $208.4 million in 1955.

Military items excluding radio in the electrical apparatus export category amounted to $120.7 million last year, compared to $99.4 million in 1955. Big portion of totals is for electronic gear.

Scientific and professional instruments, including some electronic instruments, are listed separately in Commerce Dept. export statistics. These too have climbed steadily in export value, with a rise to $85.3 million in 1956 from $68.3 million in the previous year.

Additional electronic gear may be involved in $548.8 million worth of classified commodities that are not itemized in Department of Commerce statistics.



Developments ABROAD

• **In Amsterdam** a new Philips ship radar operating on an 8 millimeter wavelength has been demonstrated, is expected to be marketed later this year. Set is reported to give good definition, showing the ship itself, surrounding craft and their courses. Trials point up advantages in waters with heavy traffic.

• **In South Africa** a Johannesburg engineer reports development of electronic controls to make power plants operate automatically without attendants. Arnold L. Owen thinks controls will solve South Africa's problem of getting power into remote areas where demand doesn't justify expensive transmission lines from generating stations. Foreign firms are said to be interested in the controls for releasing highly trained men for higher level work at big power stations.

• **Moscow** reports construction of a new tv center, claims it will be world's tallest building—1,650 ft. Station will start transmitting both black-and-white and color in 1960 over a 74-mile radius, increasing Moscow reception tenfold; rooftop antennas can then be removed and indoor ones substituted, says report heard in Vienna.

• **Britain's** Ministry of Supply has bought Mullard 5 mev linear accelerator designed specifically for industrial radiography. Machine is 9 ft long, mobile and can be raised or lowered 8 ft. It's said to give higher energy and x-ray output (over 500 roentgens per minute at 1 meter) than machines previously used in radiography.

EXPORTS and IMPORTS

In Amsterdam the board of Philips Incandescent Lamp Works is interested in getting Philips shares listed on the New York Stock Exchange. Decision may not be made for some time. Philips will soon be officially quoted in Zurich and other European stock exchanges.

Chairman Pieter F. S. Otten told shareholders that greater emphasis will be placed on issuing debentures abroad. Expansion of Philips has far exceeded expansion of the Dutch economy, whose capacity to absorb substantial bond and share issues has decreased.

In Montreal Canadair Limited has received a contract from Atomic Energy of Canada Limited for final design and construction of principal components for a beta-ray spectrometer. Contract is believed worth $2.5 million. Spectrometer will be used by AECL's Chalk

River lab, is designed to keep pace with progress in nuclear physics.

West German radio and tv sales in 1956 increased 35 percent over the previous year, helping to boost nation's electrical industry sales by 15 percent to $3 billion. Electrical exports amounted to $610 million, up 22 percent over 1955. Imports were valued at about $60 million, only 11 percent of exports.

Japan's 1957-58 budget provides yen equal to $936,000 for the promotion of electronics. Aid for research and pilot output will encourage production of computers, radar and control equipment. Additional long-term low-interest loans totaling $3.3 million by the Japan Development Bank are expected for electronics firms.

In London Decca Radar reports its 1956 contract for maneuvering and pilotage radar for the Royal Navy has been supplemented. New contract is for equipment to permit Admiralty ships to use the radars for high-accuracy survey work. Decca expects export orders for the radar.

Australia will get an estimated $10 million worth of electronics business initially as the result of a large number of agreements recently concluded by Australian and foreign firms. In most cases agreements provide for Australian companies to make foreign products under license. Direct foreign investment is provided in others. Large-scale Australian exports of electronic gear are not envisaged.

Canadian sales of Bendix Radio's aviation electronic products will be handled by Computing Devices of Canada under a new sales and license agreement. Line is transferred from Aviation Electric Ltd., which will continue to handle products of other Bendix divisions.

London's Plessey Co. and New York's Farrand Controls have signed an agreement under which Plessey will develop applications for Farrand's electronic machine-tool controls over the next two years.

In 1956, TOWER supplied over one hundred major Microwave Installations

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PLANTS and PEOPLE

He does it himself as . . .

Heath Builds Kit Plant

MAN with the shovel is Robert Erickson, president of Daystrom Inc.'s do-it-yourself subsidiary Heath Co. He's doing a sauce-for-the-gander bit at groundbreaking ceremonies for Heath's 142,000-sq ft plant near Benton Harbor, Mich.

Located on a 16-acre tract, new facility will consolidate Heath's operations, now scattered around Benton Harbor. Besides stock space and mail-order handling gear—and even a branch post office—plant will contain product research labs, including an echoless chamber for testing sound and hi-fi equipment.

Heath Co. originally made parts for the infant aircraft industry, branched out in the twenties as an independent plane maker. The 1927 Heath Parasol, $975 flyaway price, was sold in kit form for less than $200. During World War II, company spread out into electronics, made radio receivers for aircraft.

After the war, Heath bought up a batch of surplus parts and started selling kits for oscilloscopes. Company now uses new parts, markets more than 85 do-it-yourself kits, including direction finders and depth sounders for pleasure boats.

Shortly after president Howard Anthony was killed in a plane take-off in 1954 (echoing the 1931 test-flight death of founder Ed Heath) the Michigan firm became a Daystrom subsidiary with Erickson as president.

Bendix Sets Up Hustler Group

BENDIX Aviation's Eclipse-Pioneer division is setting up a B-58 systems department for development and production of flight-control systems for Convair's supersonic Hustler. Former systems sales man-

Business MEETINGS

June 13-14: Society for Advancement of Management, Conference on Materials handling, Hotel Statler, N. Y.

June 17-19: National Meeting of Professional Group on Military Electronics, Sheraton-Park, Washington.

June 24-28: 11th International Management Conference, Paris, France.

ager James B. Treacy moves up to manage the department.

Hustler controls include a central air-data computer which keeps track of plane's automatic systems. Innovation in the B-58 is that automatic controls are essential to flight rather than merely accessories.

The aircraft company's radio division gets a new general manager. E. K. Foster, Bendix v-p and group executive who has been running the division, shucks the responsibility onto former assistant A. E. Abel.

Meantime, Bendix Scintilla division, maker of ignition products and connectors, pushes $5-million expansion program in Sidney, N. Y. Expansion is scheduled for completion in 1961. Plan will add 200,000 sq ft to Scintilla's 530,000-sq ft production space.

Moves for IBM EDP Division

IBM presses to finish construction of facilities in White Plains, N. Y., for temporary quarters for its electronic data-processing division, is also opening a radioisotope lab in Endicott, N. Y.

New Endicott lab will study components of data-processing equipment. It contains instruments for radiochemical analysis of bearings, contacts and gears, radiographic analysis of castings.

Data-processing division hq will move to White Plains in September, but not for long. The group that moves in from IBM's downtown New York building will move out again in 1959, take up space in buildings to be constructed on Company's 440-acre tract in nearby Armonk Village.

Sales Shuffle at Sperry

SHUFFLE in sales line-up at Sperry Gyro's surface armament division moves J. M. Geiger up to assistant division sales manager. M. V. Burggraf takes over as sales manager for Sperry Utah engineering lab.

Two new assistant sales managers are W. D. McLean for vessel equipment and P. V. Kellman for ground equipment. The recently formed surface armament division builds surface-to-surface and surface-to-air missiles and electronic systems to go with them.

New Division at Beckman

HUNDRED percent increase in sales of process instruments in last year is behind Beckman Instruments' recent establishment of a process instruments division. Headquarters of the new division is in Fullerton, Cal., with an eastern engineering and production facility in Ronceverte, W. Va.

Scientific instruments sales manager Mark H. Howlett moves up to head the new operations. He reports to John F. Bishop, general manager of three Beckman divisions—scientific instruments, process instruments, and the Berkeley division. Bishop will shortly get a fourth, a systems division now being formed.

Thomas V. Parke moves into Bishop's old seat as manager of scientific instruments.

Royal-McBee to Build New Lab

STEPPING up research and development of advanced data-processing equipment, Royal-McBee Corp. will build a $2-million research lab on a 100-acre site in Bloomfield, Conn. The 75,000-sq ft plant will permit Royal to double present research staff.

Plans call for completion of the center by mid-1958. Firm's research group is at present in Hartford.

New Ivory-Hunter in the West

LONGREN Aircraft Co. manufacturing vice president, W. R. Miller moves out to start his own firm.

New firm, Miller Associates, Los Angeles, will join ranks of personnel recruitment consultants, irreverently termed "ivory-hunters." Mill-

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er's firm will specialize in finding technically trained executive talent for aircraft and electronics industries.

PLANT Briefs

Babcock Radio Engineering moves into a new 25,000-sq ft facility in Costa Mesa, Cal.

Two-year-old R&D firm **General Atronics Corp.** expands into new quarters in Bala Cynwyd, Pa. Larger lab facilities will be used for developing communications, instrumentation gear.

Executive MOVES

Cleveland's Victoreen Instrument Co. moves former product, sales manager **Duane M. Mayhew** up to v-p for sales, gives him a board seat.

Wilson McMakin takes over as v-p of All-America Cables & Radio, Commercial Cable, and Mackay Radio, three operating companies of American Cable & Radio, itself a subsidiary of IT&T. McMakin is industrial relations director for all three operating companies, was an assistant vice president.

E. Douglas Graham moves from Detroit's Gemmer Mfg. to become vice-president for manufacturing services of Raytheon.

T. J. Geoghegan leaves Laboratory for Electronics, takes over as Microsonics Inc. president.

F. Lee Foster Jr. becomes v-p and sales manager of Baird-Atomic, Cambridge, Mass.

Topp Mfg. moves plant manager **Eric C. Butt** up to works manager of its four Los Angeles plants.

Robert L. Mansfield moves from Alexandria, Va., office of American Machine & Foundry's Micro-pak division to become defense products manager for the firm's Raleigh, N. C., operations.

Delco Radio division of General Motors hires **Fred W. Young** away from Texas Instruments, makes him manager of semiconductor sales.

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Reps Push Transistors

EXPANDING transistor market leans more and more heavily on conventional distribution channels. Clevite transistor line is now sold in Texas, Arkansas, Louisiana and Oklahoma by Dallas rep **J. Y. Schoonmaker.** Metropolitan New York representative for the line is **A. L. Livera & Associates,** Madison, N. J.

Texas Instruments sets up eight new distributorships in key eastern industrial areas to handle smaller-than-production-run lots of semiconductors. **Electronic Wholesalers Inc.** serves Washington, D. C.; **General Radio Supply** handles the Camden, N. J.-Philadelphia area, **Lafayette Radio Corp.** sells the north Jersey industrial complex, and **Milgray Electronics Inc.** serves New York City. Four offices of **Radio Wire Television Inc.** serve Boston, New York City, Jamaica, N. Y., and Newark, N. J.

General Transistor is setting up a distribution subsidiary, General Transistor Distributing Corp., with GT v-p Allen Easton as president. With a dozen-odd reps and some factory salesmen, GT thinks wholesale distributors are vital to growth of transistor market, hopes to attract more jobber sales by consumer-marketing techniques. First on list of jobbers is **Arrow Electronics,** Mineola, N. Y.

Two new reps for Aladdin Electronics are **R. B. Barnhill,** Towson, Md., in the mid-Atlantic and Florida areas, and **Rene Bluzat,** Chicago, for northern Illinois and Wisconsin.

New rep in East Meadow, N. Y.: **Harry Reizes,** former radio-tv trade-press advertising salesman, serving audio and hi-fi lines for metropolitan New York and New Jersey.

INDEX TO ADVERTISERS

Airpax Products Co. 36
Assembly Products Inc. 39
Belden Manufacturing Co. 23
Bisnoff-Armus Associates 38
Eitel-McCullough Inc. 9
Electronics 31
General Electric Co. 8
General Mills Mechanical Div. 7
General Radio Company ..... 3rd Cover
Kearfott Company Inc. 32
Markem Machine Co. 36
McGraw Hill Book Co. 45
Microwave Associates Inc. 26, 27
Photocircuits Corporation 29
Precision Paper Tube Co. 39
Radio Corporation of America ..... 4th Cover
Radio Frequency Laboratories Inc. 25
Raytheon Manufacturing Co. ..... 2nd Cover
Sangamo Electric Co. 18
Servo Corporation of America 41
Standard Record Manufacturing Co. 10
Stewart Warner Electronics, A Div. of Stewart Warner Corp. 3
Tower Construction Co. 43
Tung-Sol Electric Inc. 28
United Air Lines 2
United Shoe Machinery Corp. 4
Unitek Corporation 38
Vitro Corporation of America 35
Waltham Watch Co. 11
Wincharger Corporation 12

PROFESSIONAL SERVICES 46

CLASSIFIED ADVERTISING
F. J. Eberle, Business Mgr.

EMPLOYMENT OPPORTUNITIES .. 46, 47

PROPERTY
For Sale 46
For Rent 46

EQUIPMENT
(Used or Surplus New)
Wanted 46

In Our June 1 TECHNICAL Edition, Don't Miss . . .

• **Slow-scan** tv. Stephan K. Altes of GE tells how narrow-bandwidth signals are used to transmit picture information to distant points over voice-communication facilities. Converter samples standard video signals to produce slow-scan signals with 800-to-one bandwidth compression. Conventional video can still be supplied to nearby monitors.

• **Scatter** transmitter. High-frequency military transmitter redesigned especially for ionospheric scatter communications is described by Hollis and Collins of Page Communications Engineers and Schmidt of Rixon Electronics. Radio-frequency portion uses neutralized triode to drive two triodes with grounded grids. Triodes deliver 8 to 12 kw to eight-tube grid-separation power amplifier. Output power is 60 kw from 30 to 65 mc.

• **Radar** flight simulator. Donald L. DeMyer of General Motors describes portable instrument that uses pulsed klystron operating in the X band to provide artificial echo to test radars. Target velocities from 200 to 1,000 mph in either direction can be simulated between 800 to 24,000 yards range. A variable delay simulates aircraft's straight-in approach and other aircraft approaches may be created by supplying various sweep waveforms from external sources.

• **Transistorized** strobe. John Patraiko of Ford Motor Co. describes system in which magnetically picked-up reference pulses feed a transistorized amplifier and shaper. Output triggers pulser circuit for strobe lamp. One-microsecond pulses at rates between 3,000 and 60,000 flashes per minute are produced by unit which determines torque by measuring dynamic shaft twist.

• **Paging** by induction. L. E. Philipps of Auth Electric Co. tells how one-way signals are transmitted selectively to pocket-carried receivers. Pulses of any one of seven frequencies from 6 to 20 kc at preselected rates energize a large inductive loop. Pocket receivers in the loop field convert audio bursts to d-c pulses; amplify pulses as low-frequency audio that drives tuned reed striking a diaphragm.

• **Air traffic** control. Peter Caporale of Civil Aeronautics Administration describes short-distance air navigation system. It gives azimuth continuously and distance when challenged by beacon equipment in aircraft within range.

• **Electronic** crowbar. Electronic switch that protects high-power transmitting tubes against spontaneous breakdown is described by Roger G. Wenner of International Telephone & Telegraph Corp. Circuit also has high-powered beam-voltage pulser for exhausting gases in tube manufacture and a high-level beam-voltage modulator for high-powered backward-wave oscillator applications.

electronics READER SERVICE CARD

FOR ADDITIONAL INFORMATION ON ADVERTISEMENTS AND NEW PRODUCTS

Additional postage MUST be added to cards for all FOREIGN MAILINGS

Here is How to Use the Card!

WANT MORE INFORMATION ON ADVERTISEMENTS?

For more information on an advertisement, circle page number of advertisement in section A on the reader service card (below).

If there is more than one advertisement on the page, the position of the ad will be indicated by letters following the page number. The letters following the page number will indicate the ad's positions: R-Right, RT-Right Top, RB-Right Bottom, L-Left, LT-Left Top, LB-Left Bottom, M-Middle, MT-Middle Top, MB-Middle Bottom (i.e. 230L). Diagrams on back of this page show how to use the key.

On pages with no number such as bleed pages, count from the last numbered page to find the number. Inserts are numbered using last numbered page plus A, B, etc. If you are not sure of a page number, consult the advertisers index.

WANT MORE INFORMATION ON NEW PRODUCTS?

Each New Product item in ELECTRONICS has a number (P1, P2, etc.). Circle the corresponding number in section B of the Reader Service Card (below).

YOUR ACCURACY ASSURES CORRECT REPLIES

There are two cards for your convenience. Use one, or both if necessary. Print carefully, then tear off and mail. We are unable to process cards where name and address is illegible.

See Fractional Page Diagram on Other Side of This Page!

FILL IN NAME, POSITION, COMPANY & ADDRESS HERE

JUNE 10·57
CARD EXPIRES SEPT. 10TH

• electronics • READER SERVICE CARD

Please Print Carefully

NAME POSITION

COMPANY

ADDRESS

FOR ADDITIONAL INFORMATION ON AN AD, CIRCLE CORRECT NUMBER IN SECTION A

SECTION A

2	7	10	18	26	29	36T	38M	41	3rd Cover
3	8	11	23	27	32	36B	39T	43	4th Cover
4	9	12	25	28	35	38T	39B	2nd Cover	

NEW PRODUCT INFORMATION? USE SECTION B

SECTION B CIRCLE FOR NEW PRODUCTS HERE

P1	P6	P11	P16	P21	P26	P31	P36	P41	P46	P51	P56	P61	P66	P71	P76	P81	P86	P91	P96
P2	P7	P12	P17	P22	P27	P32	P37	P42	P47	P52	P57	P62	P67	P72	P77	P82	P87	P92	P97
P3	P8	P13	P18	P23	P28	P33	P38	P43	P48	P53	P58	P63	P68	P73	P78	P83	P88	P93	P98
P4	P9	P14	P19	P24	P29	P34	P39	P44	P49	P54	P59	P64	P69	P74	P79	P84	P89	P94	P99
P5	P10	P15	P20	P25	P30	P35	P40	P45	P50	P55	P60	P65	P70	P75	P80	P85	P90	P95	P100

TEAR HERE

FILL IN NAME, POSITION, COMPANY & ADDRESS HERE

JUNE 10·57
CARD EXPIRES SEPT. 10TH

• electronics • READER SERVICE CARD

Please Print Carefully

NAME POSITION

COMPANY

ADDRESS

FOR ADDITIONAL INFORMATION ON AN AD, CIRCLE CORRECT NUMBER IN SECTION A

SECTION A

2	7	10	18	26	29	36T	38M	41	3rd Cover
3	8	11	23	27	32	36B	39T	43	4th Cover
4	9	12	25	28	35	38T	39B	2nd Cover	

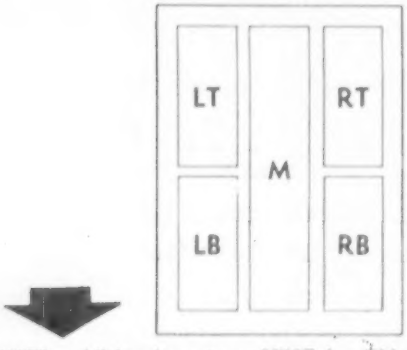
NEW PRODUCT INFORMATION? USE SECTION B

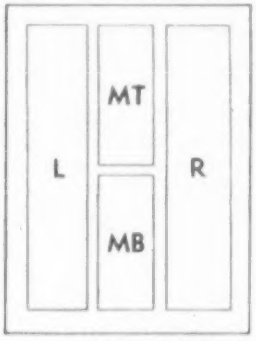
SECTION B CIRCLE FOR NEW PRODUCTS HERE

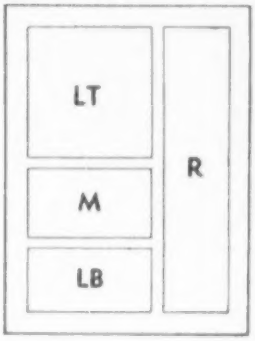
P1	P6	P11	P16	P21	P26	P31	P36	P41	P46	P51	P56	P61	P66	P71	P76	P81	P86	P91	P96
P2	P7	P12	P17	P22	P27	P32	P37	P42	P47	P52	P57	P62	P67	P72	P77	P82	P87	P92	P97
P3	P8	P13	P18	P23	P28	P33	P38	P43	P48	P53	P58	P63	P68	P73	P78	P83	P88	P93	P98
P4	P9	P14	P19	P24	P29	P34	P39	P44	P49	P54	P59	P64	P69	P74	P79	P84	P89	P94	P99
P5	P10	P15	P20	P25	P30	P35	P40	P45	P50	P55	P60	P65	P70	P75	P80	P85	P90	P95	P100

DIAGRAMS BELOW SHOW HOW TO USE THE KEY

ON PAGES WITH MORE THAN ONE ADVERTISEMENT







NOTE: additional postage MUST be added for mailings from FOREIGN COUNTRIES

FIRST CLASS
PERMIT NO. 64
(SEC. 34.9 P.L.&R.)
NEW YORK, N. Y.

BUSINESS REPLY CARD
NO POSTAGE STAMP NECESSARY IF MAILED IN THE UNITED STATES

4¢ Postage Will Be Paid By

ELECTRONICS
Reader Service Dept.
330 West 42nd Street
New York 36, N. Y.

FIRST CLASS
PERMIT NO. 64
(SEC. 34.9 P.L.&R.)
NEW YORK, N. Y.

BUSINESS REPLY CARD
NO POSTAGE STAMP NECESSARY IF MAILED IN THE UNITED STATES

4¢ Postage Will Be Paid By

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New York 36, N. Y.

On pages with more than one advertisement, the page number PLUS the correct letters (as shown above) are necessary to indicate the POSITION of the advertisement.

You must circle the page number with the correct letters after it (i.e. 240 L, which means page 240 Left).

USE THIS KEY

R—Right

RT—Right Top

RB—Right Bottom

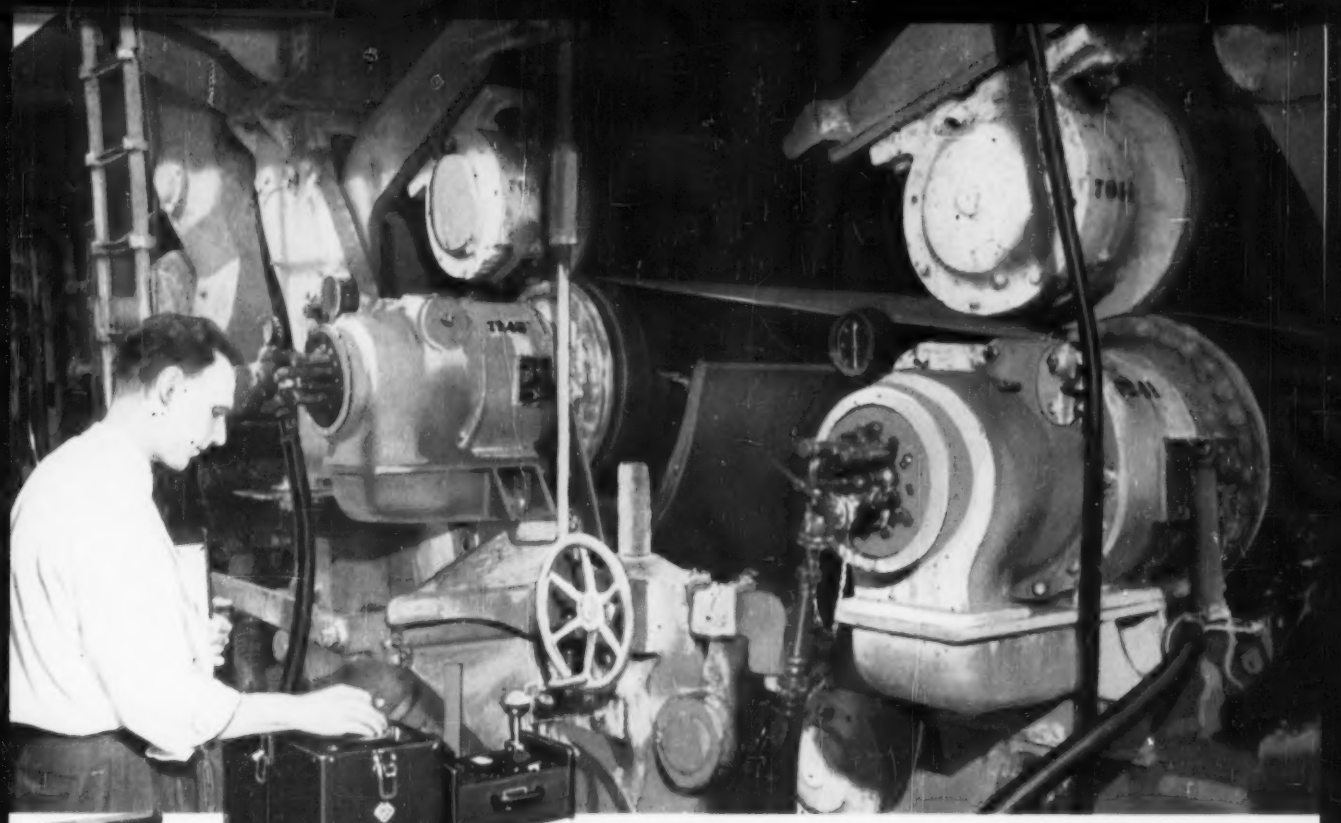
L—Left

LT—Left Top

LB—Left Bottom

M—Middle

MT—Middle Top



Paper Mill Noise *down 15db*

Noise levels produced by suction rolls in paper mill machines constitute an industry-wide problem. At Scott Paper Company, engineers have been able to evaluate this problem properly at the machinery sites with the aid of the G-R Sound-Level Meter and Sound Analyzer.

The suction press roll, a hollow cylinder of approximately 3′ diameter, contains thousands of small holes which are partially evacuated. The suction from within draws water from the paper and felts as they pass through the press nip. Considerable noise is created when air rushes back into the holes as they are uncovered by the paper leaving the roll.

Sound-level measurements and frequency analyses have led the way to the development of a silencer which reduces the noise at its source through effective control of the rapid re-entry of air into the suction holes. The overall level at a typical Scott Mill (most of which is from 1200c, 1800c, and 2400c peaks) has been lowered by better than 15 db to the background level of the plant.

Type 1551-A
Sound-Level Meter, $385 . . . basic tool of the G-R Sound-Measuring line . . . reads directly sound-pressure levels from 24 db to 140 db, and to 190 db with accessory high-level microphones . . . built-in weighting networks as specified in A.S.A. standards . . . internal calibration system permits convenient, rapid standardization . . . instrument is light in weight, dependable, compact, and completely self-contained.

Type 760-B
Sound Analyzer, $520 . . . for narrow-band measurements . . . ideal for analyzing noises of rotating, reciprocating, and other cyclic mechanisms where prevalent frequency components are harmonically related . . . direct reading over 25- to 7500-cycle range . . . bandwidth is 2% of selected frequency . . . instrument frequency response is flat within ±2 db over entire range.

Type 1550-A
Octave-Band Noise Analyzer, $535 . . . for rapid, accurate analyses of broad-band sounds — rattles, buzzes, hisses — whose sound energies are widely distributed over the audio spectrum . . . 8 bands cover the frequency range from 20 to 10,000 cycles; meter readings are simply added to settings of a calibrated attenuator to determine sound levels in each band . . . this instrument is particularly valuable for determining noise spectra of vehicles and machinery, for measuring sound-transmission losses of building walls, partitions, and floors, and for conducting speech-interference investigations.

Write for the G-R Sound Bulletin for complete descriptions of these and other sound and vibration-measuring instruments.

All G-R Products are now covered by a *2-Year Warranty*

General Radio Company

275 Massachusetts Avenue, Cambridge 39, Mass., U.S.A.

Broad Avenue at Linden, Ridgefield, N. J. **NEW YORK AREA** 1000 N. Seward St. **LOS ANGELES 38**
8055 13th St., Silver Spring, Md. **WASHINGTON, D. C.** 1150 York Road, Abington, Pa. **PHILADELPHIA**
6605 W. North Ave., Oak Park **CHICAGO** 1182 Los Altos Ave., Los Altos, California **SAN FRANCISCO**

Another RCA first in 110° design

RCA-17BZP4

- Weight—only 10 pounds
- Length—only 12 9/16 inches
- No Ion-Trap Magnet Needed

Scale: 1 square = 1 inch

Pioneer in the development of 110°-deflection picture tubes for compact black-and-white TV receivers, RCA presents the 17BZP4—the 17-inch-type, rectangular, glass tube designed specifically to meet popular demand for large-screen TV in smaller, lighter-weight cabinets. Here is a very short picture tube with a large viewing area of 155 square inches—3 inches shorter than types having the same size faceplate and 90° deflection. Super-aluminizing produces bright, high-contrast pictures that have made RCA picture tubes famous. The new RCA electron gun of the "straight-type" design *DOES AWAY ENTIRELY WITH THE NEED FOR AN ION-TRAP MAGNET!*

Available in quantity to meet your production schedule, RCA-17BZP4 is another important addition to RCA's expanding family of 110°-deflection types—including the RCA-21CEP4, the first commercially available 110° tube, a 14-inch developmental type now available for sampling to equipment manufacturers, and a 24-inch type in development.

For sales information and delivery schedule on RCA 110°-deflection types, call your RCA Field Representative. For technical data, write RCA Commercial Engineering, Section F 19Q2, Harrison, N. J.

RADIO CORPORATION OF AMERICA
Tube Division — Harrison, New Jersey

NOTE: *RCA can supply you w... the horizontal and vertical defl... tion tubes and components need... for 110°-deflection-angle syste...*

RCA FIELD OFFICES

East: HUmboldt 5-3900
744 Broad Street
Newark 2, N. J.

Midwest: WHitehall 4-2900
Suite 1181,
Merchandise Mart Plaza
Chicago 54, Illinois

West: RAymond 3-8361
6355 East Washington Bl...
Los Angeles 22, Calif.